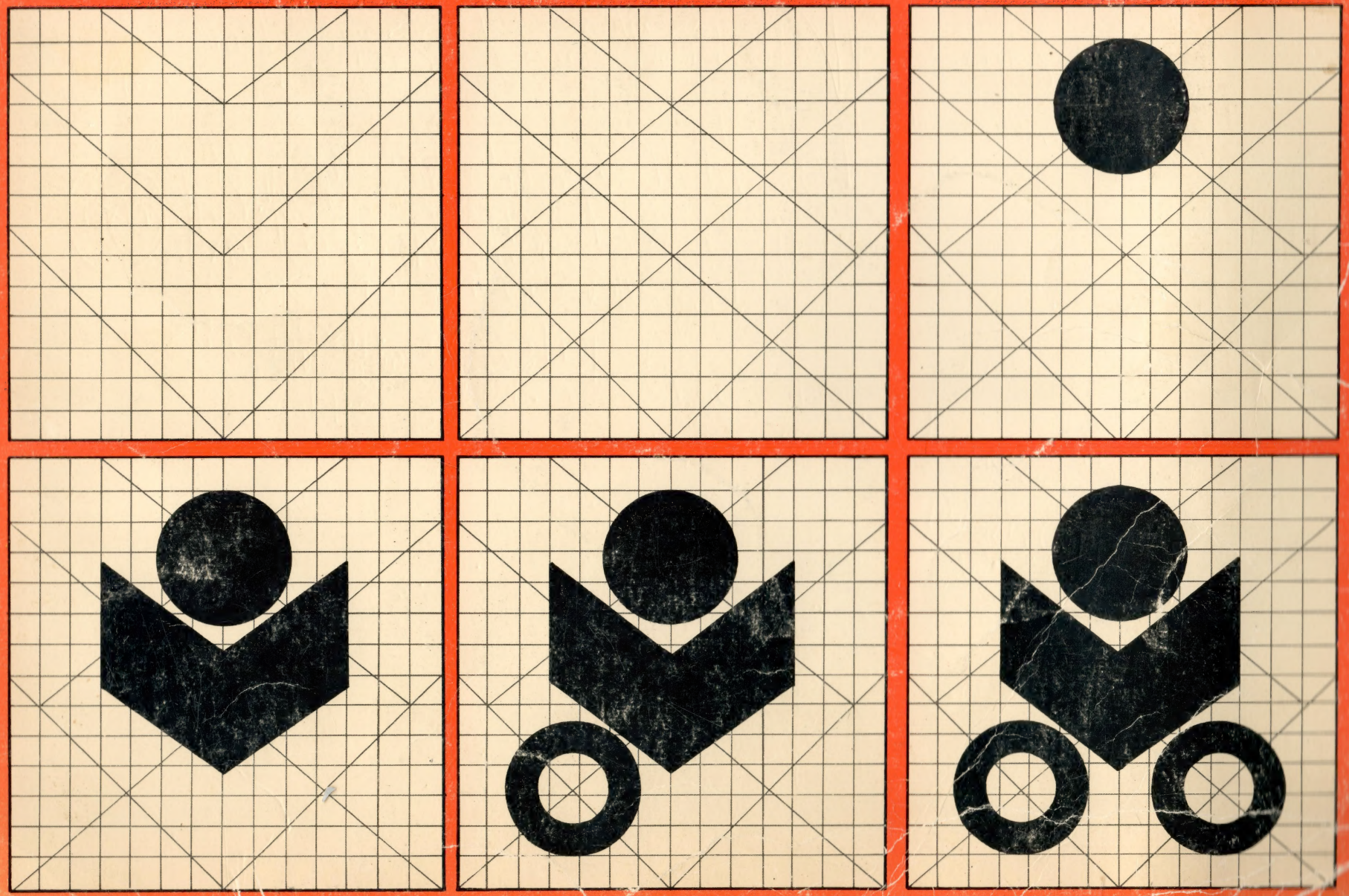
GRAPHICAL COMMUNICATION AND DESIGN

(5)

MORLEY and HEATON



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G. MORLEY, ASTC, MIIA
R. HEATON, MCCEd, FTCs, FRSA

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Foreword

The implementation of Technics in the Secondary School Curriculum has broadened the educational scope of courses in Industrial Arts, which have included in their aims; the appreciation of creativity, quality in design and development of competence in graphical communication.

Communication in the form of words and numbers has always been an important element in Educational programmes, but a third and important area, graphics, is becoming increasingly apparent in our highly developed technological society.

Pictographs, symbols, and images have been used for centuries to convey meanings, but in our fast moving and complex society, graphical means are being used to an ever increasing extent, to present information quickly, and effectively convey meanings with the minimum of confusion and maximum ease of interpretation.

The spatial concepts of shape, size, direction, proportion, and colour are vital elements of this form of communication and are manifest in many areas of everyday life. Most people come into contact with or are affected by graphical communication in the form of highway signs, trade symbols, house plans, graphs and diagrams in books and newspapers, and drawings for industry, all of which are a specialised form of representational drawing which convey information symbolically.

Although graphical communication has been included to some degree in previous technical drawing courses, the opportunity for producing drawings directly related to personal experiences has been limited. The scope and variety of the topics now treated, allow opportunity for the appreciation and development of design, which is now an important element in the philosophy associated with drawing as an educational subject.

Indeed the basic approach in the design aspect of any of the technics strands requires the conveying of an idea, in the form of a sketch however basic, in order for planning and development to begin.

In this book the subject matter is presented in such a way that the skills related to graphical representation are explained and the qualities which make up effective techniques are illustrated.

The new approach offered still recognises the necessity for a sound conceptual basis without which three-dimensional and geometrical problems would not be solved.

The numerous suggestions included encourage scope for individual development of these skills and opportunity for application of the inherent creativeness within all of us, to be explored.

List of Contents

The reader will appreciate that in any book which follows the creative approach there is some desirable overlap between formal and non-formal work, and that the former, being interspersed for the sake of interest among the latter, does not readily lend itself to a rigid classification. This list of contents is therefore intended to guide the reader into the book according to the above arrangement.

Book list

Technical drawing

Draughtsmanship	R. Fraser Reekie	Arnold
Topic Technical Drawing	D. Burnand	Gibson

Modern Technical Drawing	G. A. Hicks	Pergamon
Technical Drawing and Design	G. Wicks	Hulton
Exercises in Technical Drawing	B. Halliwell and S. Waterhouse	Schofield & Sims
Technical Drawing	F. B. Mayock	Heinemann
Technical Drawing	A. W. Boundy & I. C. Hass	McGraw-Hill

Design

What is a Designer?	N. Potter	Studio Vista
Introduction to Creative Design	D. H. Edel, Jr	Prentice-Hall
Creative Synthesis in Design	Algar and Hayes	Prentice-Hall
Design of Design	G. L. Glegg	C.U.P.
Nature of Design	D. Pye	C.U.P.
Attitudes in Design Education	K. Baynes	Lund Humphries
Ergonomics	K.F.H. Murrell	Chapman & Hall
Human Engineering: Guide for Equipment Designers	W. E. Woodson & D. W. Comover	University of California Press
Mechanisms, Linkages, and Mechanical Controls	N. P. Chironis	McGraw-Hill
Design: Sources and Resources	B. Ballinger and T. Vroman	Van Nostrand Reinhold
Designing Todays Manufactured Products	John R. Lindbeck	McKnight & McKnight

Art and graphics

Change in Art Education	D. Field	Routledge & Kegan Paul
Looking and Seeing	Kurt Rowland	Ginn
Introducing Graphic Techniques	R. Capon	Batsford
Communications Graphics	M. P. Murgio	Van Nostrand Reinhold
Sign, Symbol and Form	B. Ballinger and R. Ballinger	Van Nostrand Reinhold
Step-By-Step Perspective Drawing	C. Coulin	Van Nostrand Reinhold
Art in a Machine Age	E. Maxwell Fry	Methuen
Graphic Symbolism	Colin Breckon	McGraw-Hill

Environment

Design in the Built Environment	R. Frazer Reekie	Arnold
Landscape and Buildings	K. Lindley	Pergamon
Design for Play	R. Dattner	Van Nostrand Reinhold
Cities	L. Halprin	Van Nostrand Reinhold
Design for the Real World	Victor Papanek	Pantheon Books

Woodcraft and metalcraft

Foundation of Design in Wood	F. O. Zanker	Dryad
Design and Craft in Education	F. O. Zanker	Dryad
Designing in Wood	L. H. Laic and D. A. Jones	Harrap
Creative Form in Woodwork	E. W. Bond and J. T. Fisher	McGraw-Hill
Design Your Own Craftwork	W. E. Brooke and K. Barkley	Murray
A Designer's Approach to Woodwork	D. W. Eglestaff	Pergamon
Metalwork Design	T. Pettit	Arnold
Introduction to Creative Metalwork	A. W. Walls and R. Naylor	Arnold
Creative Design Metalwork	R. Sandham and F. R. Willmore	Arnold
Creative Form in Metal	J. T. Fisher and C. Dinning	Macmillan
Metalwork Design	R. N. Wheeler	Cassell
Woodwork and Design	A. Yarwood	Nelson

Notes to teachers

There are some mechanical aspects of technical drawing which this book does not cover and which you may prefer to demonstrate and explain in the traditional manner. The use of instruments is one example.

You may consider it helpful to organize the drawing room so that it provides a source of ideas and a reference library for research. Magazines and industrial house journals, wall charts, models, craft books and drawing books, coloured paper and card, scissors, and glue will add to both interest and efficiency.

You may also wish to add interest by organizing some local fieldwork from time to time. This may include the study and sketching of almost everything which can be seen, especially well-designed things. The recording of houses, roads, road signs, shops, car parks, cranes, bridges, and public buildings may be an approach to consider. This is not suggested as a lesson in observation only, but also in analysis, constructive criticism, understanding of the environment, design, and better design.

Education through drawing

By all means let us accept the traditional values, but then extend them by involving the individual in an imaginative way. The approach then increases not only the educational value and thereby the validity of drawing, but also of the writing, observing, inquiring, thinking, planning, experimenting, analysing, and recording, which become an essential part of it.

To put the best into a pupil, we must first of all get the best out of him. His sense of responsibility should be developed as his ideas are encouraged and guided to worthwhile goals. When drawing is approached creatively, for which, perhaps more than any other school subject except art, it has always offered unique opportunity, a large degree of self-motivated cooperation can be achieved.

The individual's ideas are important; but not any wild idea, only the filtered ideas which come from intellectual, as distinct from frivolous, thought process. This is not to say, however, that inspiration and feeling are excluded. It may be best, therefore, to classify the pursuit of ideas into formulation, expression, improvement, recording, expansion, analysis and communication, evaluation and final reassessment. Several restarts within the sequence are to be expected.

The work examples

The exercises are designed to challenge creative thinking from the word go. Where basic studies have been included, it is simply with the aim of providing additional skills and knowledge before further degrees of originality are called for.

Training

This book does not obviate the need for skilful and sympathetic teaching. Progressive creativity needs guidance, as well as inspiration. Training in the approach must be given continuously and systematically, especially where teachers intend submitting candidates for design-based examinations.

Standards should not be allowed to deteriorate. To some it may seem unnecessary to state this, but when a degree of freedom has been given for individual expression safeguards are necessary.

Assessment

Where the exercises are creative and the pupil has to contribute ideas of his own, the assessment of the work should consider the two main criteria of *good ideas* and *good draughtsmanship* as the determinants of empowered creative ability. Credit should be given from the earliest beginning to examination level. Some children may have more imagination than draughting or artistic ability, while for others the reverse may be true. In both cases, while being credited for their acceptable contributions, they should be led to appreciate the need for improvement.

Design

The design process can be a very complex activity at a high level and the authors make no exaggerated claims for the book in this respect. The authors prefer to interpret many design-associated projects and exercises in terms of simple planning, more acceptable in the introductory stages of design education. At the elementary level, the pupil is asked for contributions of style and shape, only at the later stages is a knowledge of materials and craft processes assumed.

Dimensions

Dimensions have been kept to those few necessary for an appreciation of a problem. Many drawings are completely without dimensions. In these cases, pupils are expected to provide their own according to their analysis of the problem and their subsequent judgements. This is part of their creative involvement.

Where pupils are instructed to make closely similar drawings to those given, a fair degree of faithfulness is required short of measurements being taken from the examples.

Originality

While individual ideas are encouraged, it is only to be expected that few will achieve originality in the unique sense. However, a creative idea may well be original as far as an individual is concerned. This should therefore be a factor in any assessment of results.

Observation

The approach to many of the exercises requires the pupils' becoming more readily observant of their surroundings, both in relation to everyday articles and aspects of the environment. Make this an opportunity for direct studies of real objects or actual situations.

The less able

The authors have not found any particular difficulties with the responses or attitudes of the less able to the new approach. On the contrary they have observed a reawakening of interest and enthusiasm, which they attribute to more meaningful work than copied orthographics of bearing brackets; and to their recognition of creative contributions, however humble. Responsibility for planning and decision-making is a stimulus which encourages results valued by teacher and pupil alike.

Section notes

Formal work

The content is confined to those basics in geometry and projection which are related to design and communication, and which can be directly applied. Other constructions which may be necessary for individual work can be presented by the teacher or obtained from traditional textbooks.

It is essential that these basics are readily understood if the creative spirit is to be empowered. They are not included as a source of reference only, but must be drawn to be appreciated.

Trade symbols and logograms

Trade symbols provide supporting geometrical applications and first-class examples of design and communication between industry and commerce and consumers. It should be stressed that they have all been professionally designed, yet their geometry is usually quite simple. Subtleties in construction and proportion are present, thus differentiating between the purely elementary and the professional standards to be emulated.

Further problems can be devised readily at all levels. Year Seven designs for a cub-scout shield could be followed by further projects involving not only the design of symbols, but also of actual souvenirs for a city, places of national interest or beauty, charities, and international themes.

It is obvious that there could be much integration between the arts and crafts and other subject areas.

Craft-based design

Bearing in mind the ability range for which this book has been planned, the craft-based design problems have been kept at the elementary level. The examples should be well within the range of the average secondary-school pupil, who should also be familiar with some of them through workshop activities in wood and metal.

It is not suggested that the examples illustrate perfect designs or that they should be included in any workshop scheme. Indeed, they are labelled either as basic ideas for individual application, or as general classwork projects with scope for individual variations on the main theme. They could perhaps be described as starters from a design base to be departed from according to interest and ability.

Environment

It is one thing to accept our man-made surroundings and another to have some positive thoughts for improvement. It is not necessary to be a qualified town-planning architect in order to make a contribution or criticism. Like the old lady sprinkling flower seeds into her window box, we can all be involved in some way.

There are two approaches to planning the environment. The simplest is when the private individual plans for himself. It is of little or no concern to other people how he arranges his lounge furniture, the tools in his garage, or the paths in his garden. Planning the public environment is much more demanding as many people will be affected. All people should be concerned about the exact location of a pedestrian crossing, the logical arrangement of facilities at a service station or swimming pool, and the clearance of slums to make way for a pedestrian shopping precinct.

School children are not town planners, but to put them in a similar position, in which they have to think, investigate, gather the facts, discuss and make classroom decisions, is educational. They can be trained to analyse a situation, to recognize that an environmental design problem exists, and to formulate their own line of inquiry into it. This activity is assessable at all levels, and should become a compulsory part of any design-based examination syllabus.

Nuts, bolts, and fittings

The author has included only a few of the standard engineering fittings and advises that the proportions and applications of others be obtained from engineering reference books.

It is also essential to the design approach for pupils to study existing fittings, gadgets, special nuts, bolts, and screws, in order to compile a personal folio of mechanical functions which they can call upon in simple engineering problem situations.

To this end, some examples of special fittings have been shown – the unspecified one on Sheet 72 being taken from the Eclipse saw set. A range of these fittings for examination and study should be part of the drawing-room facilities. Pupils should also be encouraged to search out their own.

Ergonomics

Examples of ergonomics are limited to those which require a knowledge of average human dimensions, though this is only the fringe of a design approach which has been called 'human engineering'. Also involved here is the study of several other disciplines, including mechanical and electrical engineering, physics, psychology, medicine, anthropology, climatology, statistics, and, in this overcrowded world, sociology.

Other factors must be considered besides the linear dimensions of articulated parts. The five human senses of feel, smell, taste, hearing, and seeing are important. An operative, for example, when at the machine controls has a limited angle of vision in both vertical and horizontal planes, within which all the important instruments should be placed for constant inspection. Note the elementary application of this on Sheet 28.

The importance of human strength is seen in the example of the bow on Sheet 95. Sheet 94 shows some aspects of designing furniture for children. A baby's body could slip through wide-spaced cot bars and its head become trapped, resulting in a fatal hanging! The height of the cot rail above the mattress should guard against an active child overbalancing on to the floor.

These human factors in design could be part of any design-based examination or syllabus. Simple anthropometrics and ergonomics are not beyond the understanding of the children we normally teach. They have a direct relevance to the articles we use and our physical and mental attitudes as we are using them. A bicycle, for example, is a machine from which many lessons of this type would have a direct interest to boys.

Graphical communication

Many books on technical drawing tell us that the subject is really a 'language'—that it is concerned with communication between draughtsmen, craftsmen, and others. Few of us would argue with this. However, it could be suggested that where pupils simply copy a drawing without adding to it in some way communication does not take place. This situation could be interpreted with some degree of justification as being analogous to studying a foreign language without being allowed to speak it.

Communication from the pupil has been encouraged throughout this book, while special forms have been emphasized on Sheets 53 to 55. There can obviously be many variations on 'story communication'—the tale of a Red Indian and his attack on a stockade, an adventure of a short month in duration.

There is also a need to design symbols for use with diagrams. These are required to show force, movement, direction, and a state of being. Invent, for example, a symbol which indicates that a clock spring has been fully wound; or that the clock has stopped.

Perspective

The simplification of true perspective, as in Sheet 97, to an approximation in which the foreshortening of length is estimated instead of being projected, can encourage further interesting involvement in creativity. Pupils, including the less able, enjoy it, and their spatial judgement is further developed.

The internal view of the kitchen (Sheet 99), in single point perspective, is also simple to construct. The example has been included to illustrate human-related heights and viewpoints.

Angular perspective (Sheet 100) is a reasonably true construction and shows two simple applications.

The art approach

To emphasize the close affinities between art and technical drawing some examples have been included on Sheets 35 to 37 which exclude the use of instruments; but it must not be wrongly concluded that this requirement forms any kind of rigid boundary between artistic and technical form. There is considerable overlap, especially of art upon the purely functional, which is thereby enhanced by aesthetics, feeling for form, and creative imagination. With this in mind, the reader will recognize the high artistic content, no pun intended, of glasses and bottles, sky lines, trade symbols, toys, fun figures, logograms, and many other drawings.

Further to this, teachers of craft and design also pursue the artistic in relationship to jewellery, beaten-work, forge-work, ceramics, plastics, sculpture, laminated-work, steambending, montage, lost-foam casting and turnery. The sketch-planning of forms for these aspects of craftwork may well be included in a creative drawing course—provided it is accepted that the final form of a work of art is highly subjective, being the result of personality upon material and not of rigid adherence to artistic or technical graphics.

It has also been emphasized throughout the book that preliminary sketching activity is desirable before the final instrument drawings. In some cases, however, especially in advanced design studies, it is expected that the sketches will be of such good quality as to obviate the need for formal projections when production is not contemplated.

Time factors

Teachers who are already familiar with the design approach know that the volume of articles produced is less, but that the thinking is greater than before.

The time taken by a pupil working in a form of design activity must be frequently assessed against the educational returns, because it is so easy for some pupils to drift out of self-directed research into daydreaming. Where mental stamina is lacking overlong periods of planning as opposed to producing must be avoided. Furthermore, although class periods can provide organized opportunities for design planning, anyone who has pursued any creative processes at all knows that creativity cannot be confined by a set of timetable regulations. It cannot be turned off and on at the ringing of a bell. There must be active preparation of the mind and a rest period when thoughts and ideas can mature; for it is often out of this subconscious activity that flashes of insight may occur. For these reasons, it is perhaps good practice to present new problems towards the near-completion of an old one when thought processes have stabilized into routine, and when the germ of a new idea may find acceptance without the immediate need for action.

Perhaps we should bear in mind that there are some occasions when mental design and planning activities of a prolonged nature are either a frustration or a luxury, depending perhaps on a lack of ability or a need for expediency. Often a rough and ready solution is acceptable. A matchstick in a rattling window is immediately preferable to designing and making a fastener in copper, stainless steel, or thermoplastic resin. There will always be a demand for a chunk of wood and a six-inch nail!

Note to pupils

This book will give you about half the ideas you need for your work in drawing, you are asked to help in supplying the remainder. You should enjoy this because it allows you to be creative and encourages you to think for yourself. Your ideas, when developed sensibly, will be acknowledged and you will gain credit for showing some responsibility.

Some of the projects will take you outside the classroom, and you will be required to make notes and sketches about your surroundings or the simple articles people use every day.

There are some drawings in this book which are related to school craftwork, but only in a simple way at first, and you should find them well within your practical ability.

It is important to develop an active curiosity about the construction and shape of things. It is not enough for you simply to glance at an object. Learn to examine things to find out how they are made and how they work. It is helpful to ask yourself such questions as: Would this shape I see be more pleasing if it were longer, wider, or taller? How can I improve the arrangement of the furniture in my room? Can a road warning sign bearing the word 'Ford' be improved, to communicate to those who cannot read English? How does a ratchet screwdriver work?

In this way, you will gain a knowledge of design considerations which you can then apply with intelligence to many problems.

Preface

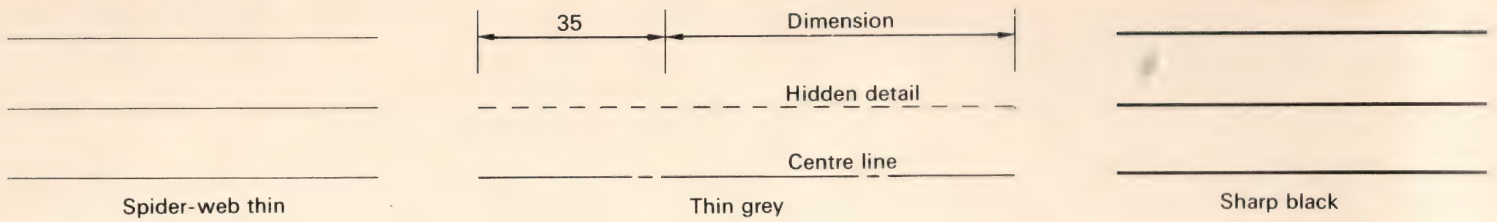
This book shows how the educational content of technical drawing can be made more creative and less mechanical. It introduces the opportunity for basic design education through enjoyable personal involvement. A training in basic techniques is combined with the development of the pupil's creative ideas.

In this way the subject becomes more educational in the widest sense. It becomes more interesting and intellectually challenging at all levels; more realistic in relationship to the environment and technological understanding; and therefore more contributory to personal development.

1 **Construction lines**

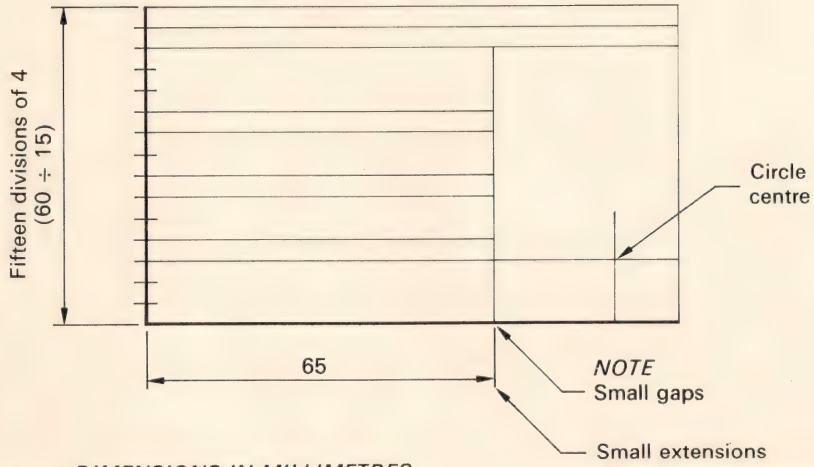
Information lines

Outlines



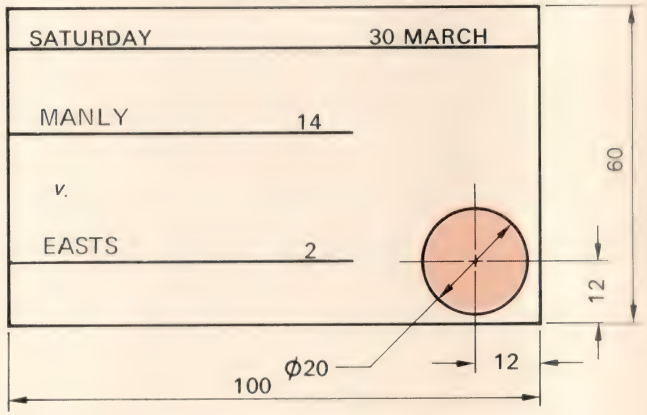
USE THESE LINES FOR THE TWO DRAWINGS BELOW

2 **Setting out for score board**



DIMENSIONS IN MILLIMETRES

3 **The finished drawing**



SCORE BOARD | SHEET 1

The lines shown at the top of the sheet are some of the types you will be using to draw, clarify, and convey your ideas to others. Drawing is a language of communication, so you can see how important it is for both readers and makers of drawings all over the world to use the same lines and symbols.

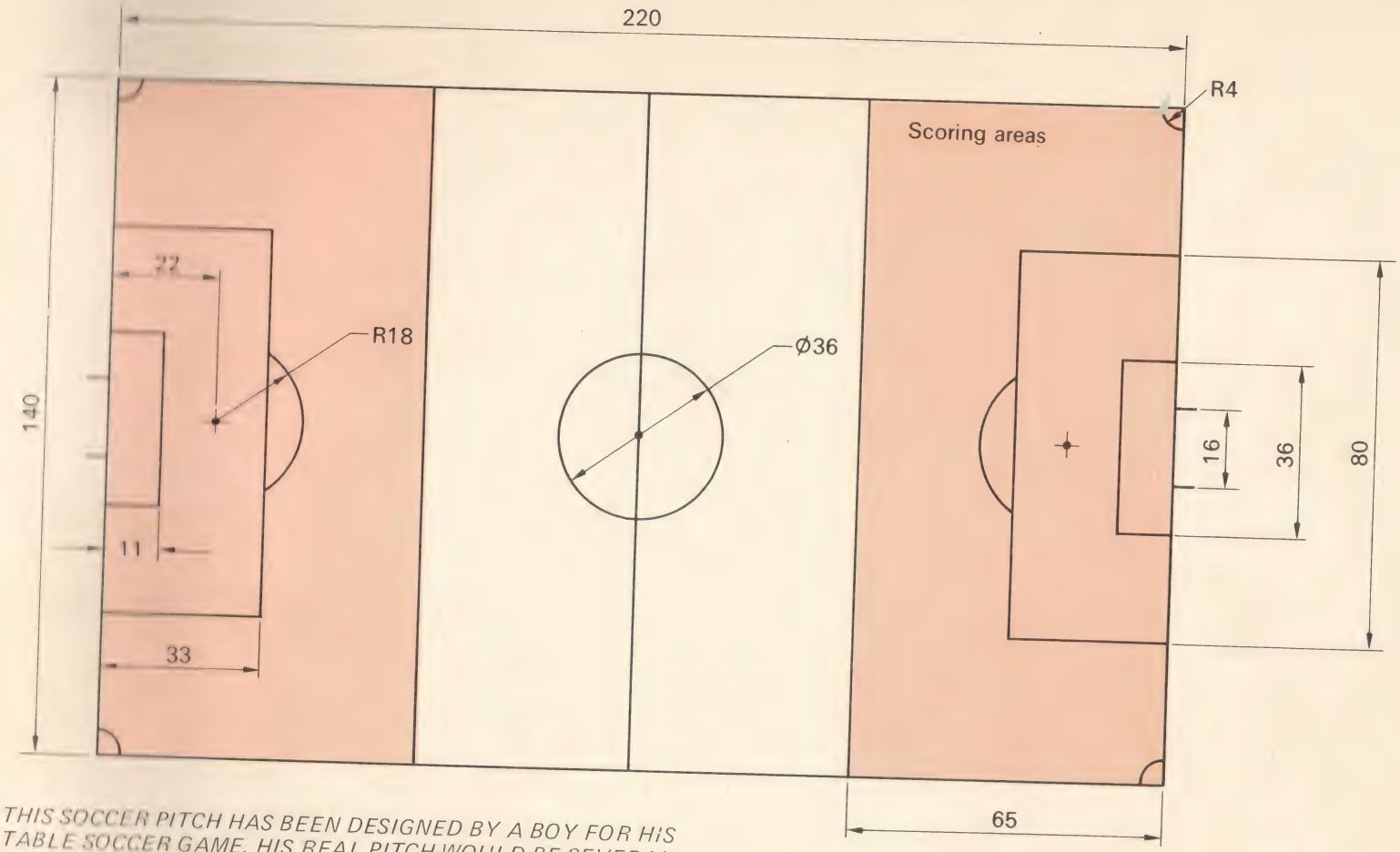
Learn how to draw sharp black lines, thin grey lines and spider-web thin lines by varying the pressure on a 2H pencil.

When the drawing is finished, clean off any unsightly construction lines. A good test of the lightness of a construction line is for you, as the draughtsman, to be the only one who can see where it is.

Print in block letters between feint lines, 3 millimetres apart. Important words, such as drawing titles, should be larger.

Exercises

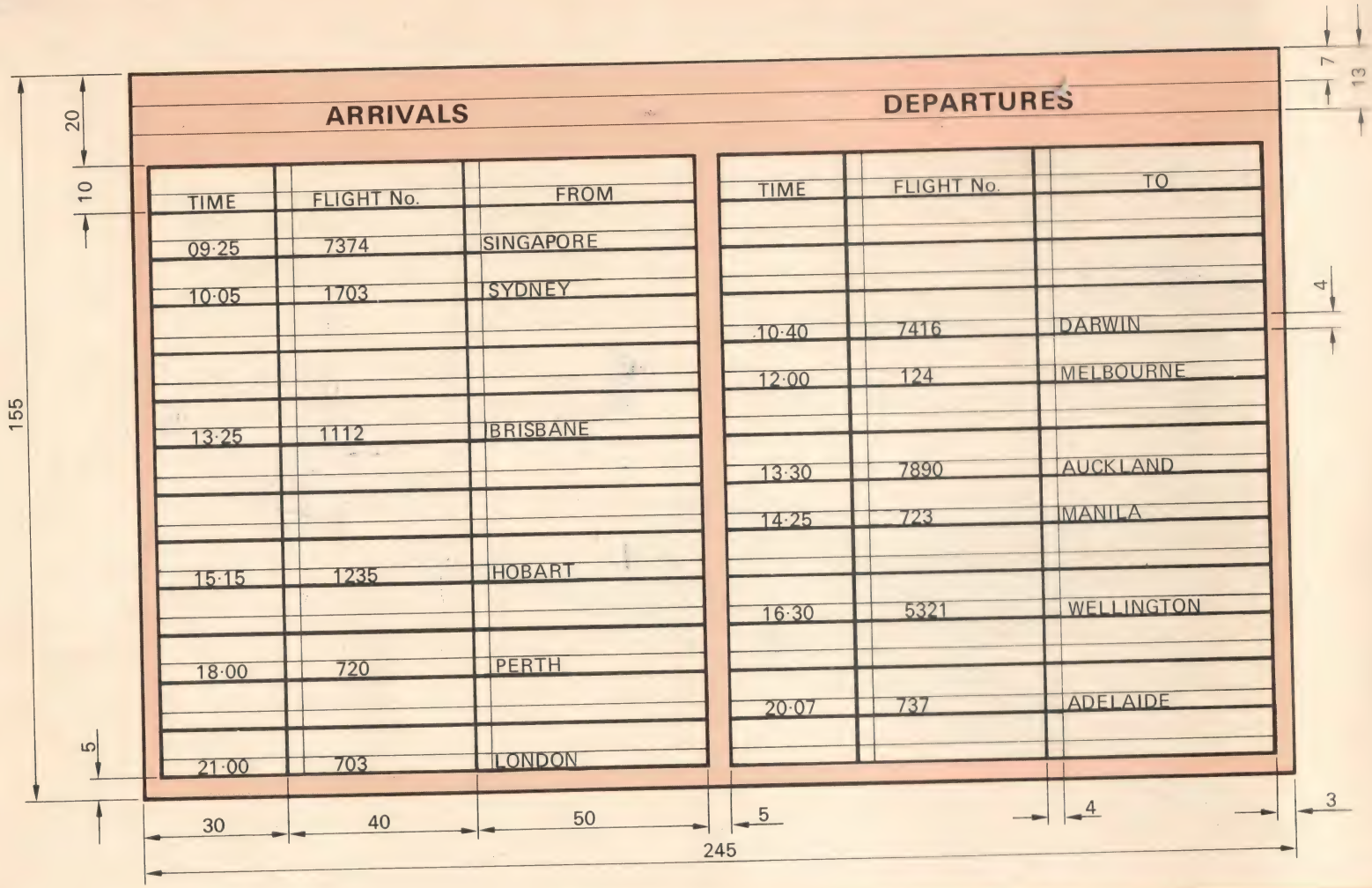
1. Draw the sets of lines illustrated in Fig. 1.
   Arrange the lines and notes in a similar way to those shown, for neatness of presentation.
2. Copy the separate drawings shown in Figs. 2 and 3.
   When you prepare to draw Fig. 3 you will obviously have to draw another Fig. 2. Try to improve your first drawing. Insert the names of your own teams and their scores.
3. Make a drawing to represent a results board for use on sports day. Show the final positions of four school houses. Add a symbol to identify the board as for sports results.



THIS SOCCER PITCH HAS BEEN DESIGNED BY A BOY FOR HIS TABLE SOCCER GAME. HIS REAL PITCH WOULD BE SEVERAL TIMES LARGER

TABLE SOCCER — SHEET 2

Draw and fully dimension the pitch to the given sizes.



AIRPORT FLIGHT INFORMATION

FLIGHT BOARD SHEET 3

This is an exercise in drawing to given dimensions, and also one in neat printing.

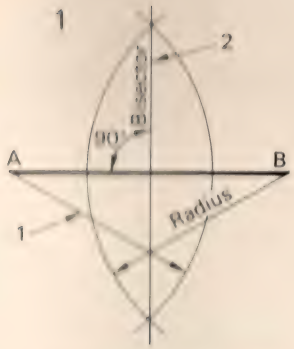
The chart represents a flight board similar to one seen in many airports. How could you tell that the example was not taken from either Sydney or Adelaide airport?

Exercises

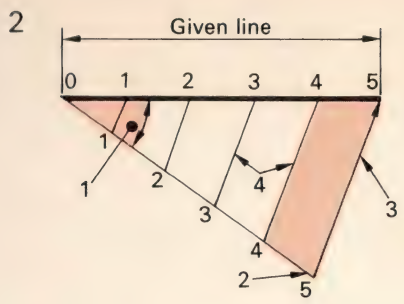
1. Set out the rectangular framework accurately according to the dimensions given in millimetres. Neatly print all the flight details and add the dimensions carefully.
2. Plan and draw a similar board which shows the following information:

'Flight number'; 'Place from'; 'Delay due to'; and 'Length of delay'.

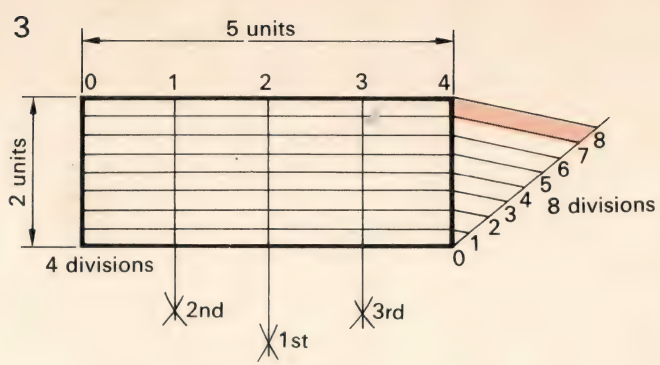
3. Make a chart of your individual school timetable, *or*, a chart showing football team fixtures either for your school team or league matches in which you are interested.
4. Make a chart to show the roads with bus routes in your locality. Consider what information this chart should provide.



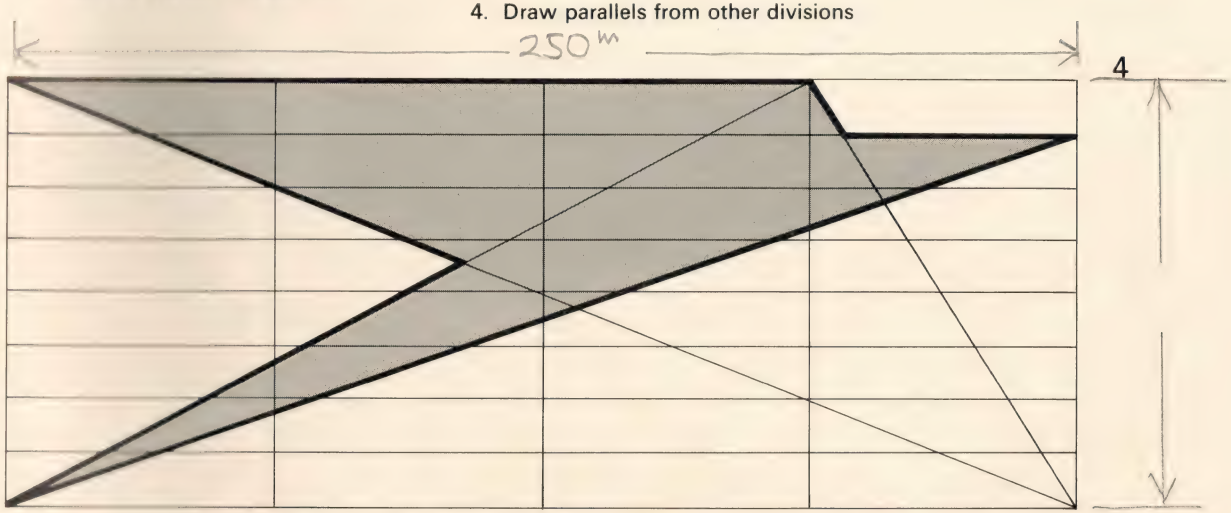
Perpendicular bisector to line AB
STAGES:
1. Strike radius, more than half AB, from points A and B
2. Join up the arc intersections



Multiple division of line
STAGES:
1. Produce any acute angle
2. Step equal divisions
3. Join to end
4. Draw parallels from other divisions



The BOAC 'Speedbird' construction grid 5 × 2 units



The 'Speedbird'
Reproduced by permission of British Airways Board with grateful acknowledgements

TRADE SYMBOL | SHEET 4

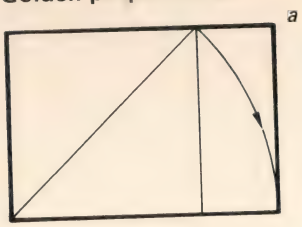
BOAC 'Speedbird' (retained in the livery of the new British Airways Board)

Figures 1, 2, and 3 show methods of dividing and bisecting a line necessary for the 'Speedbird' drawing, and for future lessons in geometry. The constructions should be self-explanatory.

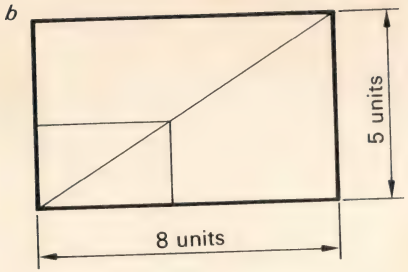
Exercises

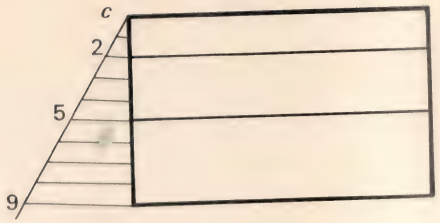
1. Study and draw the division geometry, adding the notes.
2. To a larger size, reconstruct the grid in Fig. 3 and complete the symbol as shown in Fig. 4.

1 Golden proportions



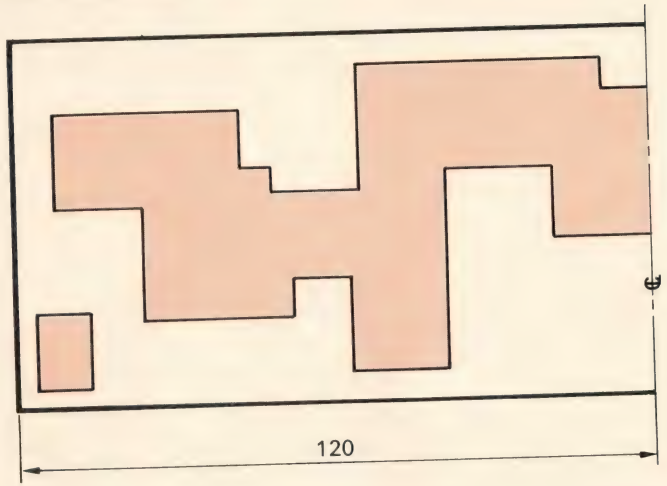
THE LENGTH IS THE DIAGONAL OF THE SQUARE





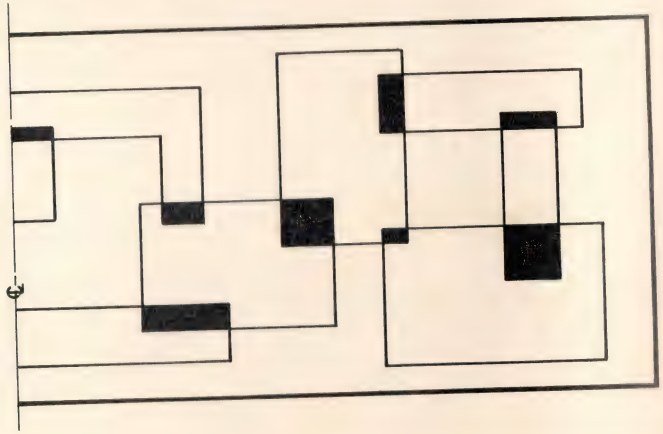
HORIZONTAL RATIO 2:3:4

2 Open rectangles



JUDGE THESE PROPORTIONS BY EYE

3 Closed rectangles



PROPORTION

SHEET 5

A square is a pleasant geometrical shape, but because its sides are all the same length it is not really as interesting to look at as a rectangle, which has length and breadth variation.

The rectangles in Figs. 1*a* and 1*b* are usually considered to be in good proportion. They have a combination of length and breadth which is acceptable to most people as being neither too squat nor too long and narrow.

In Fig. 1*b*, a smaller rectangle, with its sides in the ratio of 8:5, has been drawn along the diagonal. This is in the same ratio. The method also applies to other rectangles.

Figure 1*c* shows how a line may be divided up into a given ratio. The lines have been produced so as to divide the rectangle horizontally.

Exercises

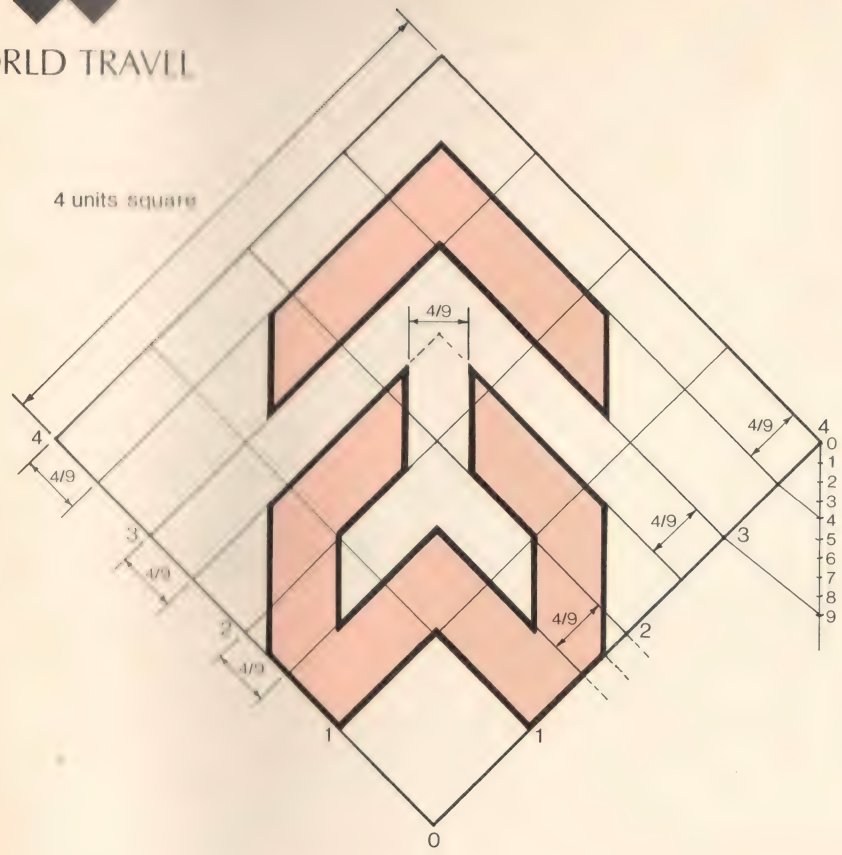
1. Draw the three rectangles in Fig. 1.
2. Study the pattern of rectangles in Figs. 2 and 3.

Notice the interesting variation in breadth, length, and position. One can look at the patterns without becoming bored by seeing the same monotonous shapes. The patterns possess unity and harmony. They are comprised of rectangular units which relate to one another pleasantly. They are not, for example, disfigured by triangles or circles in a misguided attempt at variation.

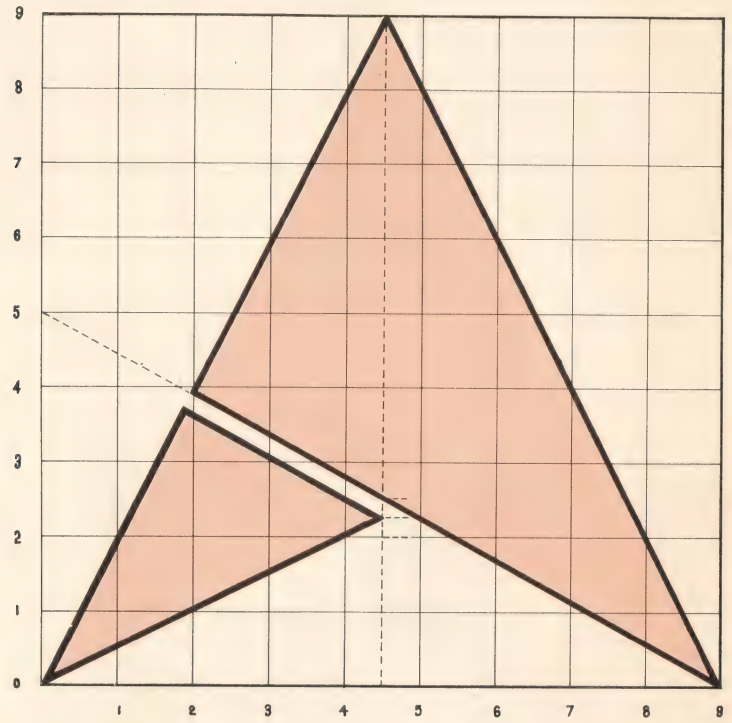
The rectangular shapes around the borders also add interest and emphasize not only the importance of the main patterns, but also of the spaces enclosing them.

3. Draw two separate rectangles each twice the length of those in Figs. 2 and 3, which are here shown drawn only to their centre lines. Using these rectangles and following the examples given complete the patterns.
4. Compare these patterns with those on Sheets 6 and 7.

WORLD TRAVEL



ANSETT
AIRLINES OF AUSTRALIA



Both examples on this sheet are examples of professionally designed line patterns which represent air travel.

TRADE SYMBOLS | SHEET 6

World Travel

The 'W' in the symbol is associated with the word "World" and also forms an abstract map of Australia, while the arrow shape represents an aircraft. The symbol is formed by a grid of sixteen squares which are further sub-divided.

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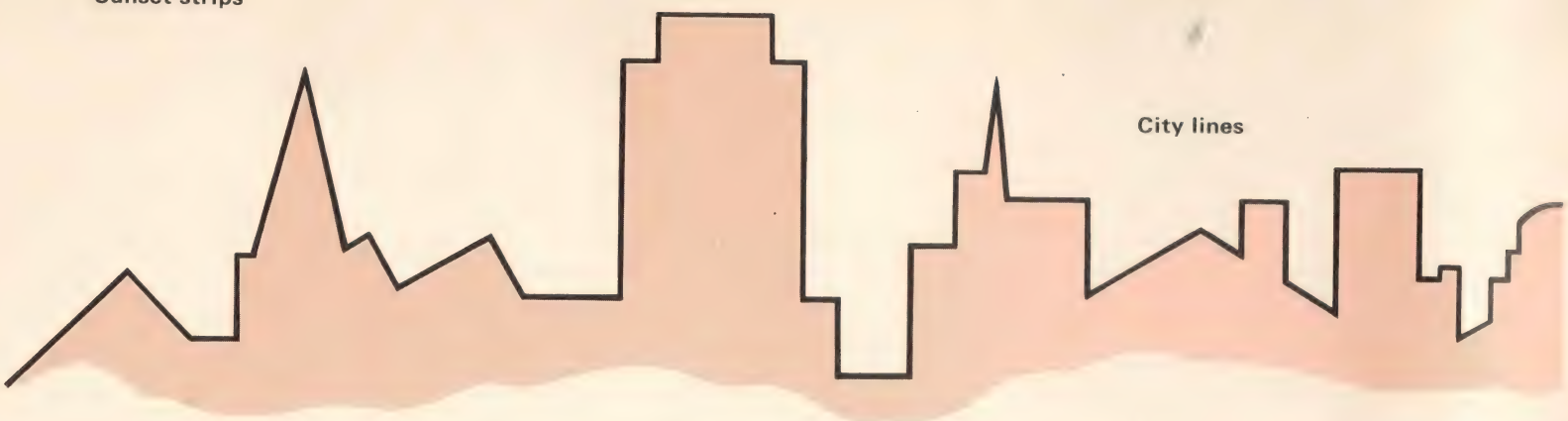
Ansett Airlines of Australia

The stylised 'A' in the Ansett symbol represents a number of interrelated ideas; 'Ansett', 'Airlines', and 'Australia'. It also is a pictograph of an aircraft or its tailfin.

Reproduced by permission of Ansett Airlines of Australia, with grateful acknowledgements.

Sunset strips



City lines

THE DRAWINGS SHOW BUILDINGS SEEN IN SILHOUETTE.
OBSERVE THE EFFECT OF DUSK ON THOSE IN YOUR OWN ENVIRONMENT

Coast lines

IS IT POSSIBLE TO TELL WHICH BUILDINGS ARE NEAREST TO YOU?
COULD YOU USE THIS THEME IN A SYMBOL FOR YOUR CITY OR TOWN?

CAN YOU SUGGEST OTHER EXAMPLES?

SKY LINES

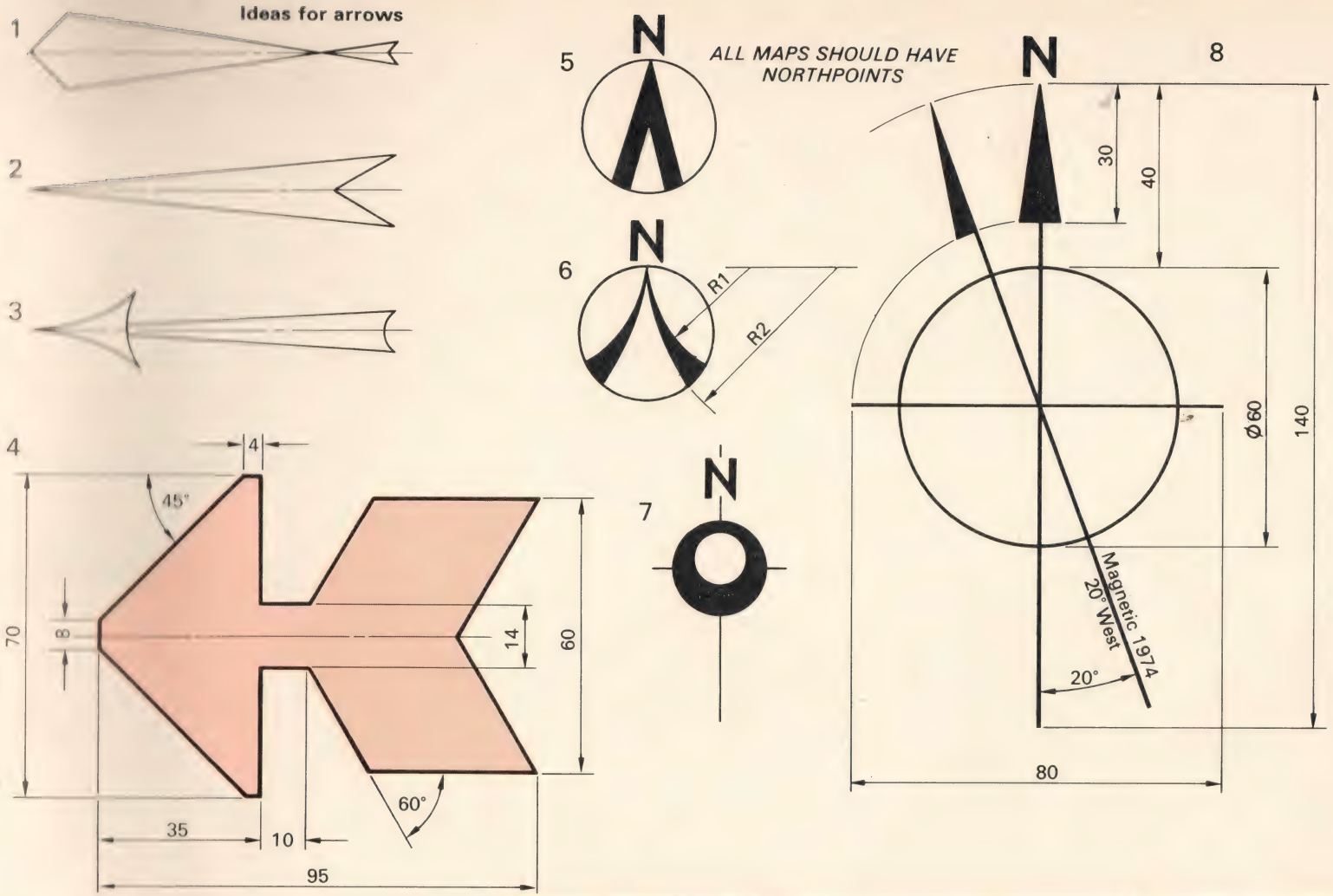
SHEET 7

The examples on the sheet show the outline of buildings silhouetted against the evening sky. These can make very interesting pattern subjects, both in reality and on the drawing paper.

Always plan your silhouettes in sketch form before making instrument drawings.

Exercises

1. Draw a *city* line and *coast* line, then plan an *industrial* line.
2. Obtain a newspaper or magazine cutting of an outdoor scene and use this as a basis for a further drawing.
3. Find out if you can draw an indoor scene. Can you put a secondary outline in front of a main one? Could you make use of a silhouette as a motif on wallpaper?



ARROWS and NORTHPOINTS | SHEET 8

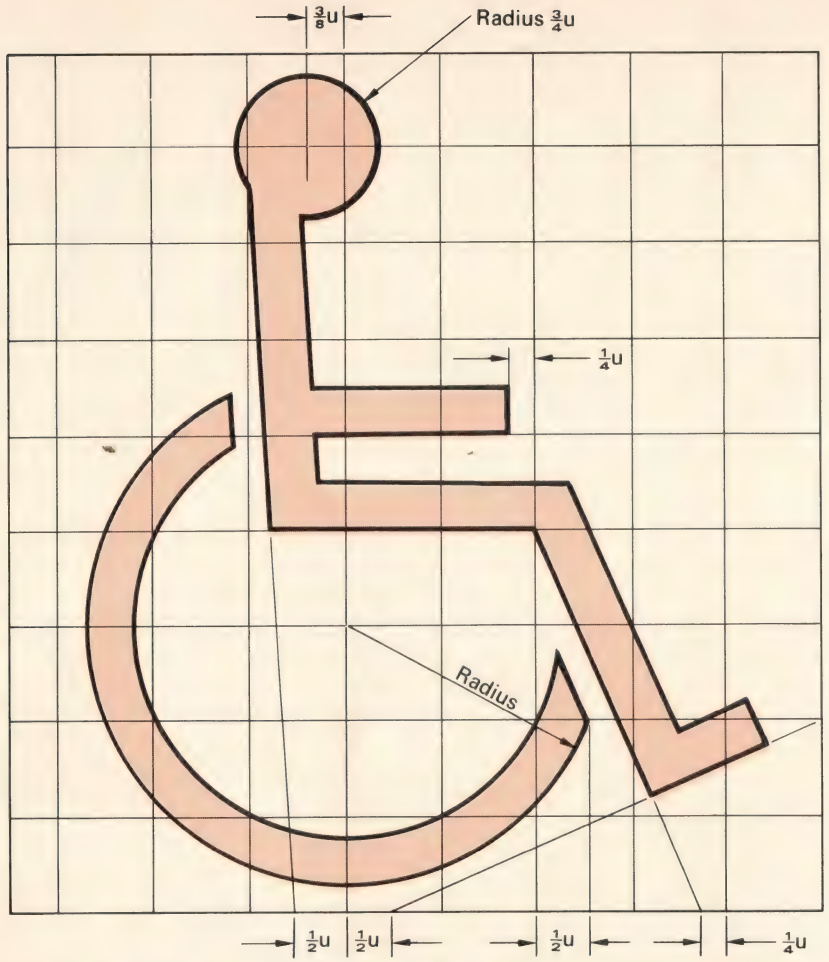
If you look about you, many different styles of arrows can be seen. They all do the same job—drawing your attention to something. Perhaps to a direction on a route, or to a special building, or to focus your attention on an advertisement on the page of a magazine.

Northpoints are important on *all* maps—even the small local maps of houses and estate roads.

Arrows and northpoints are two examples of elementary design at professional level with which you can become involved now.

Exercises

1. Draw and fully dimension Figs. 4 and 8.
2. Study the remaining examples, and use them as the basis of further drawings to your own proportions and dimensions.
3. Make a large drawing of a northpoint to your own design. Add colour as required.



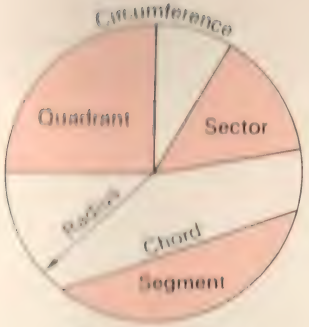
Constructional Information
GRID SIZE $9 \times 8\frac{1}{2}$ square units (u)
Extended construction lines show the points from which the body lines are drawn.
The body and wheel are one half-unit wide ($\frac{1}{2}$u).
The gaps between the wheel, leg, and back are equal.

Reproduced by permission of the Department of the Environment and the Central Council for the Disabled, with grateful acknowledgements

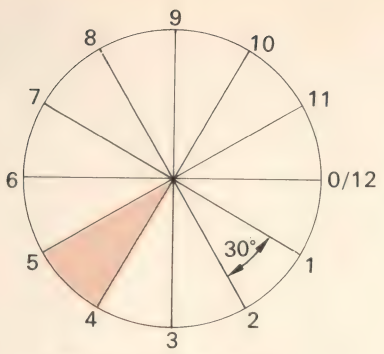
DISABLED PERSONS' SYMBOL

SHEET 9

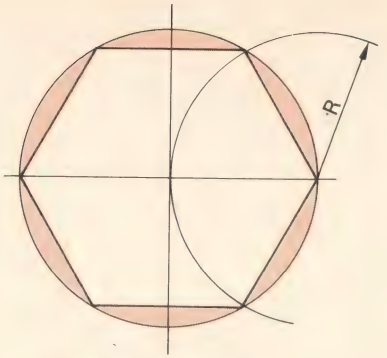
A symbol has been designed for display in buildings which offer special access or facilities for the disabled.
It is an excellent example of communication through symbolic drawing.
The international panel of experts which selected the design for use in all countries came from Switzerland, Sweden, the USA, Poland, and Great Britain.



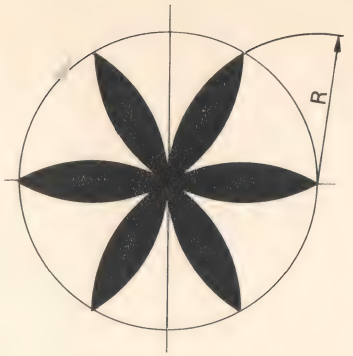
Parts of a circle



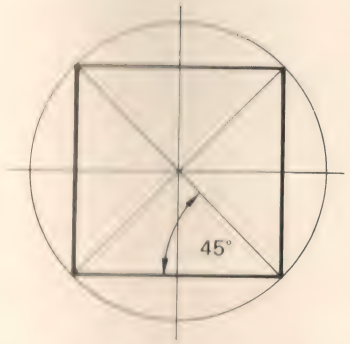
360° in a circle divided into 12 sectors by the 60°–30° set square

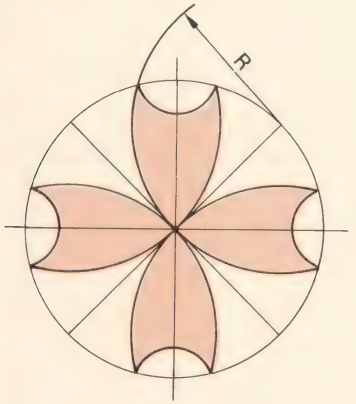


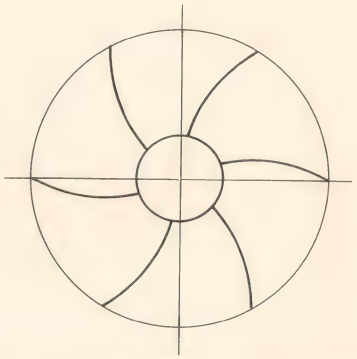
The radius steps 6 equal chords around the circumference for a regular hexagon

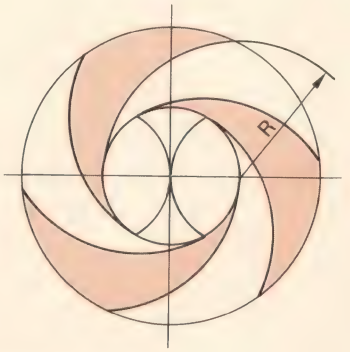


Six radius arcs for the popular petals









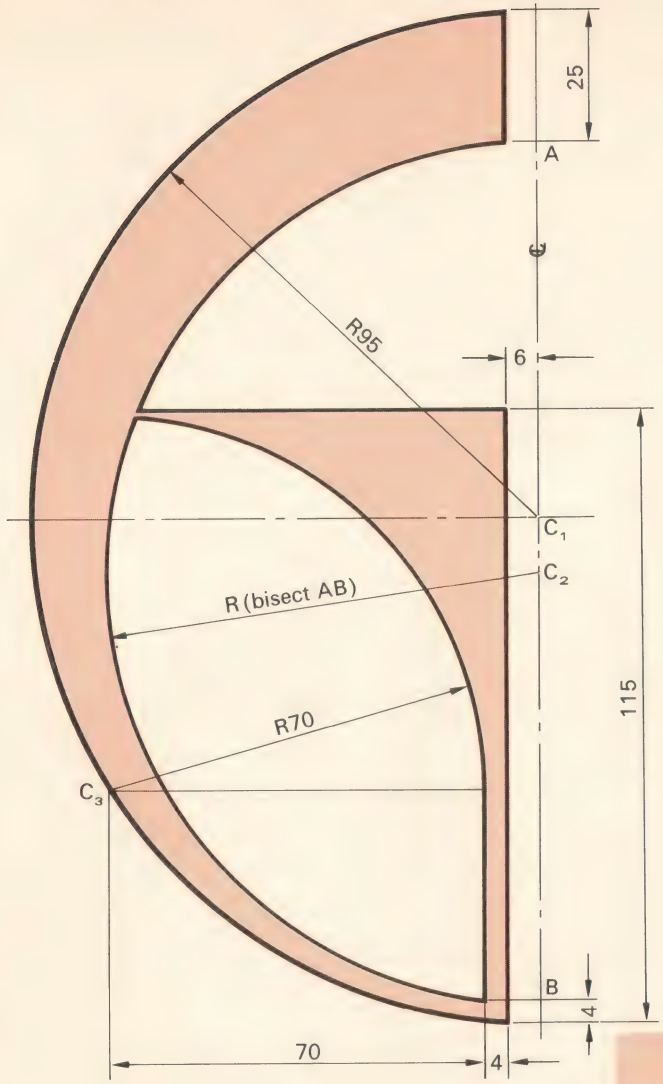
YOU SHOULD BE ABLE TO CONSTRUCT THESE FIGURES WITHOUT FURTHER EXPLANATION

CIRCLE PATTERN — SHEET 10

The figures show some elementary geometry and parts of a circle. Some elementary patterns are shown which could be used in symbol design.

Exercises

1. Copy all the drawings and notes, supplying whichever details are not given.
2. Experiment in drawing another series of circle-based patterns to your own design. Follow the principles of proportion and harmony explained on Sheet 5.



GLASS MANUFACTURERS PUT THEIR SYMBOLS AND 'LOGO' ON GLASS BOTTLES, USUALLY ON THE BASE.
THEY ARE CALLED 'PUNT MARKS'.
SEE HOW MANY YOU CAN FIND

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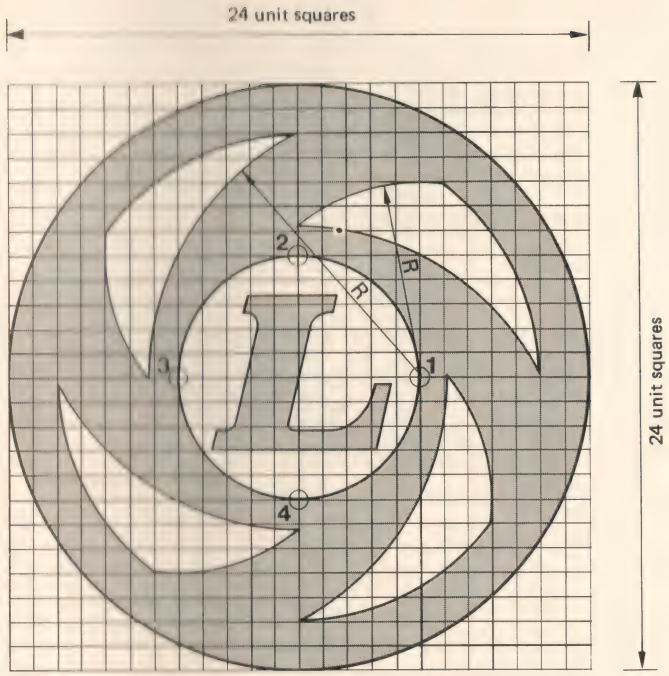
TRADE SYMBOL | SHEET 11

Glastics Ltd

A professionally designed circle pattern. Draw the complete symbol accurately.



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Leyland Australia

HOW DO YOU INTERPRET THIS SYMBOL?
HOW DOES IT COMMUNICATE TO YOU?
WHAT DOES IT SUGGEST?

DRAW THE SYMBOL TO A LARGER SIZE, AND WRITE A DESCRIPTION OF ITS MESSAGE

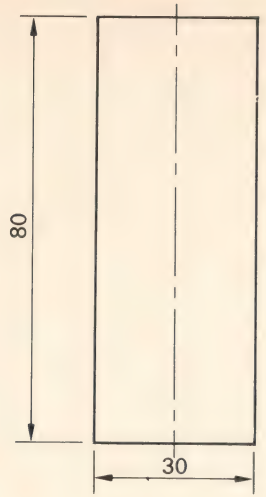
CONSTRUCTIONAL DETAILS

The construction details of the Leyland Australia symbol have been simplified by means of a grid system. The width of the border lines, surrounding and cutting across the symbol, which were not previously defined, have now been fixed as a half-square width. The height of the lettering is precisely fixed at three full squares.

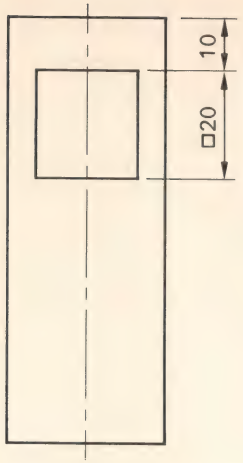
The construction of the roundel is as follows:

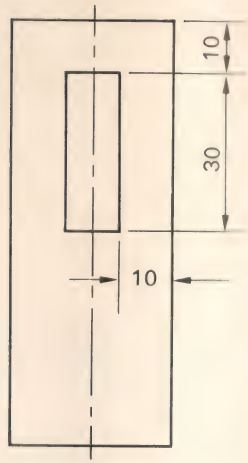
1 Scribe the outer circle to a diameter of 24 squares.
2 Scribe the inner circle to a diameter of 10 squares.
3 Scribe the intermediate circle to a diameter of 20 squares.
4 Scribe the segments from position 1 as shown by the arrows.
5 Repeat the operation from positions 2, 3, and 4.
6 Scribe the right-hand upright of the letter 'L' so that it passes through the centre of the circles and bisects the outer line of the second square above and below the centre. This gives the correct angle of the 'L'.

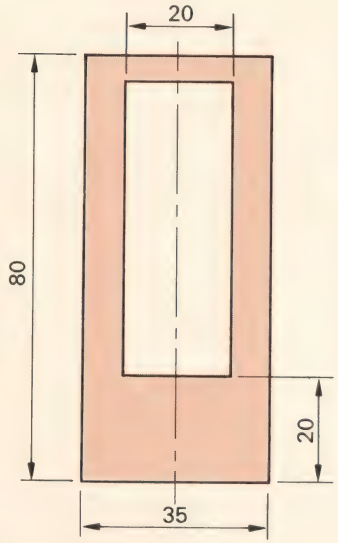
TRADE SYMBOL | SHEET 12



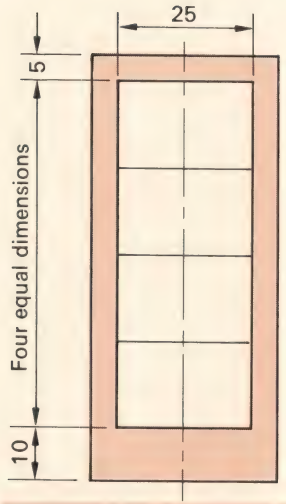
Drawings in series

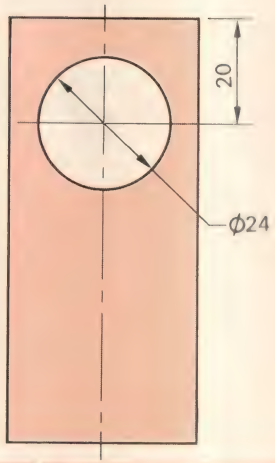






Dimensions to avoid the use of scales



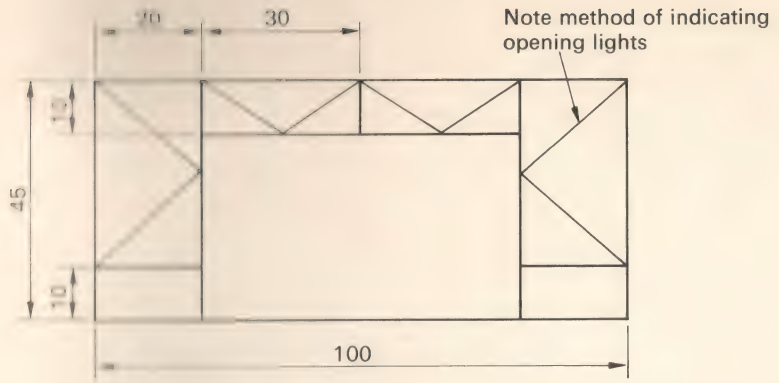


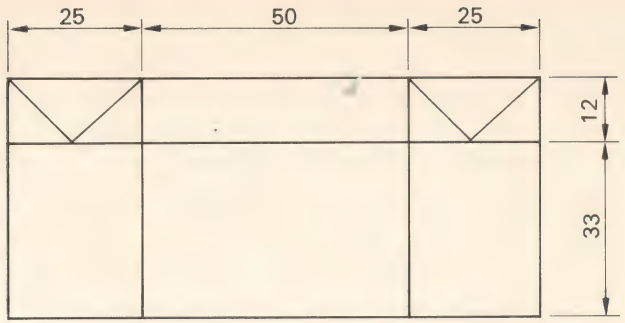
DOORS SHEET 13

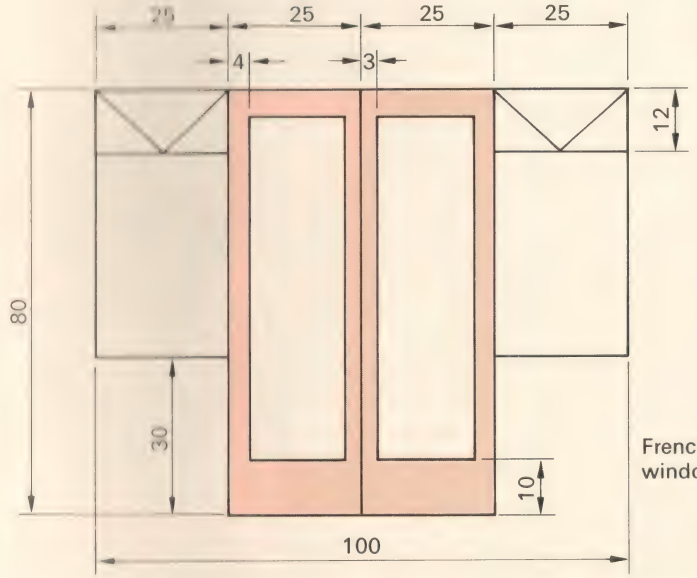
You will notice that the sheet has been divided horizontally and vertically to give well-spaced drawings which are in line with one another on common base and vertical centre lines. Lining up your work in this way aids neatness, eliminates the need to repeat measurements, and facilitates the comparison of one drawing with another. It is efficient and time-saving where multiples of similar drawings are needed. This method is known as drawing in *series*.
The dimensions of the doors are in millimetres to help you to draw them without reference to scales. Further drawings may be drawn to a scale of 1 : 25, if you wish.
Look at Sheet 16 for reference to simple scales.

Exercises

1. Set out your paper as shown and make accurate copies of the doors. Add all dimensions.
2. Take a sketch pad and record the doors you see in public buildings and homes.
   Make another series of door drawings showing these different styles of panelling and glazing.

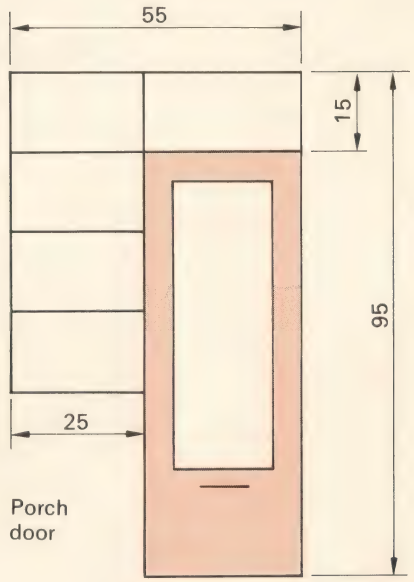






French windows

MAKE A STUDY OF OTHER GLAZED DOORS AND WINDOWS



Porch door

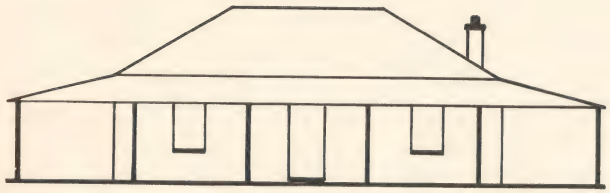
Dimensions to avoid the use of scales.

WINDOWS — SHEET 14

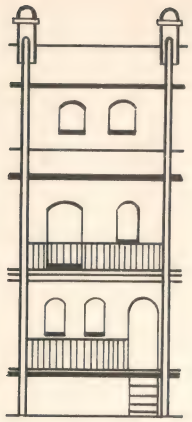
Windows, like doors, are produced to a variety of standard size units for ease of mass production. Note the method of indicating the windows which open. These are called 'opening lights'.

Exercises

1. Make accurate drawings of the windows given in the examples. Add all dimensions.
2. Study other windows and entrance doors in your school and at home. Record their measurements on scrap paper. Make a series of drawings of your own showing different designs.
3. Visit places of historical interest and make sketches of Gothic, Colonial, Queen Anne, and Contemporary window and door styles.
4. Do you think that other countries have, or have had, different window styles? Find out.
5. Study the development of windows and doors in ships, carriages, motor vehicles, trains, aircraft, and spacecraft.



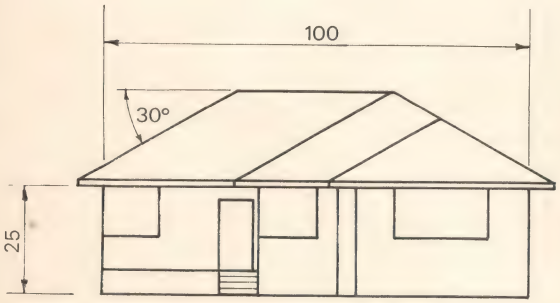
1 Australian colonial



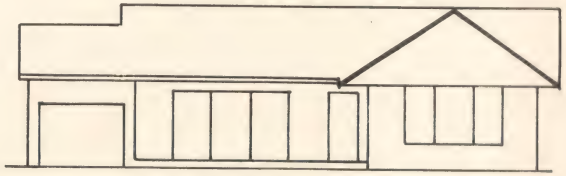
2 Terrace

3 Pre-war bungalow

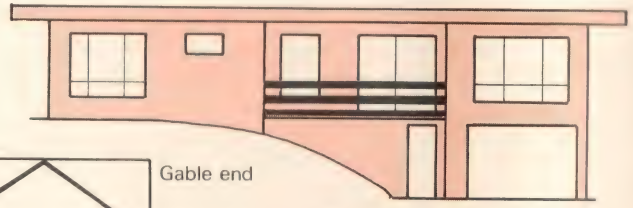
OBSERVE AND SKETCH THE HOUSES IN YOUR DISTRICT AND ELSEWHERE



4 Hipped roof



5 Ranch style



6 Contemporary

NOT TO SCALE

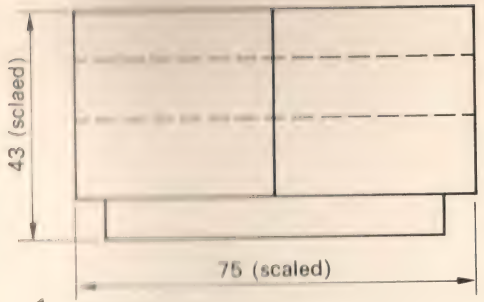
Sizes and angles given are suggestions only. Supply others in proportion

HOUSE STYLES — SHEET 15

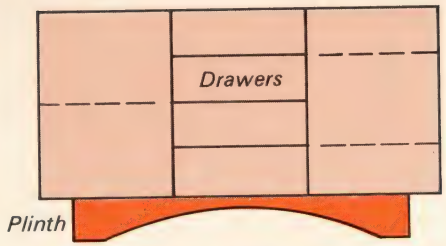
The drawings show a series of six houses of different styles. The dimensions in millimetres in Fig. 4 are to be taken as a guide to help you set up the series. The widths of houses 4, 5, and 6 are obviously different, but the room heights are the same.

Exercises

1. Make closely similar drawings to those given.
2. Obtain further ideas of house styles from direct observation of those you see about you, and from estate agents' advertisements in newspapers. Draw another series of six based upon these ideas.
3. Make a larger drawing to illustrate the style of house you live in, or would like to live in.

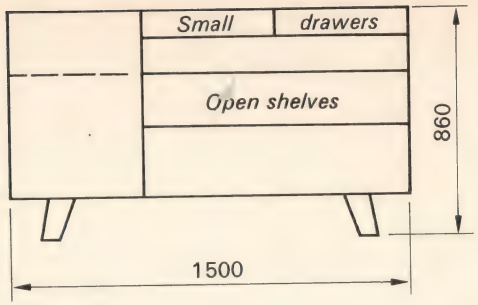


1



Buffets

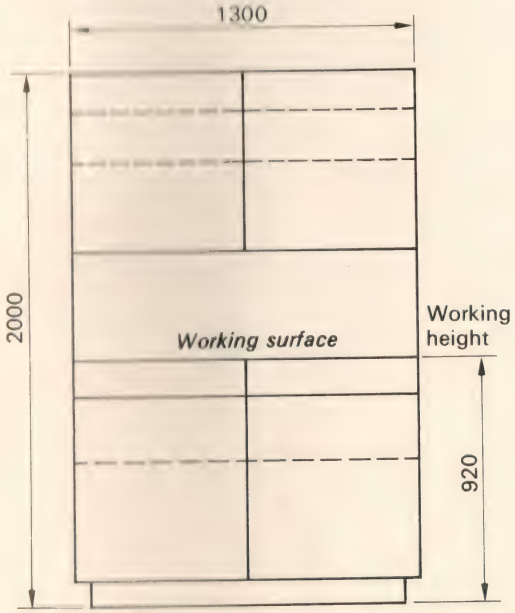
2



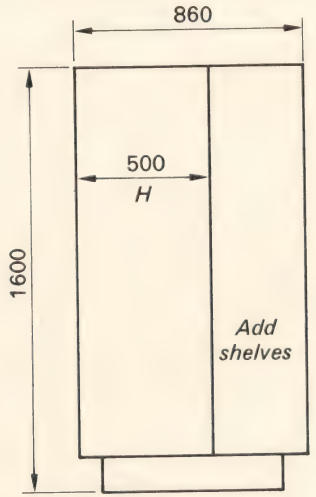
3

OBSERVE THE FURNITURE AROUND YOU AND NOTE THE AREAS AND PROPORTIONS INTO WHICH IT IS DIVIDED

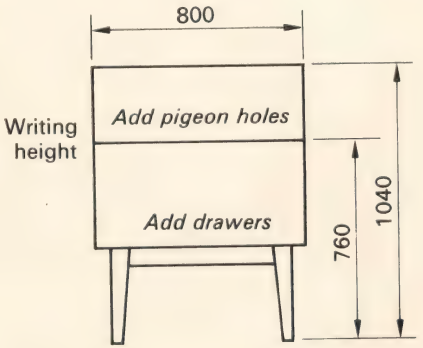
NOTE STANDARD WORKING AND WRITING HEIGHTS



4 **Kitchen cupboard**



5 **Wardrobe**



6 **Bureau**

SUPPLY DETAILS NOT GIVEN
RECOMMENDED SCALE 1 : 20

FURNITURE SHEET 16

Two of the dimensions on the first buffet (Fig. 1), 75 and 43, should help you to set up the series to a scale of 1 : 20. All other dimensions are full-size and need to be scaled down.

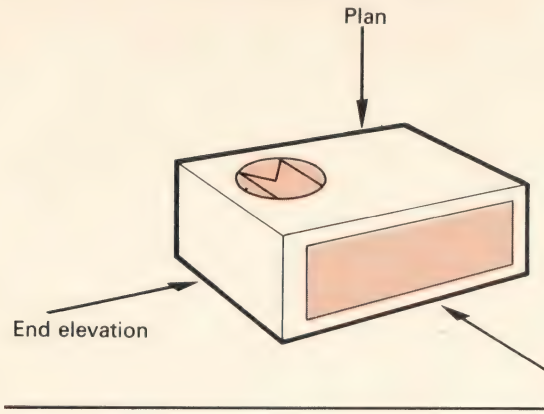
When working to scale use a special scale rule, or divide the true sizes by the scale. For example: 1500 mm scaled down by 1 : 20 becomes $\frac{1}{20} \times \frac{1500}{1} = 75$ mm, as in Fig. 1. The real sizes are always placed in the dimensions.

Exercises

1. Study and draw the series of buffets given in Figs 1, 2, and 3. Pay particular attention to the proportions of drawers and cupboards.
2. Draw your own series of three different buffets, dividing up their front areas into bases, plinths, drawers, shelves, and cupboards of varying but pleasing proportions. Consider the use to which a buffet is usually put. You may change the lengths and heights slightly, if you wish.
   Study the furniture in your own home to get ideas. Do not draw detail such as ornamentation, handles, or hinges.
3. Draw the furniture shown in Figs. 4, 5, and 6, together with a series of alteratives. Obtain furniture catalogues for guidance.
   Note particularly the *working height* and the *writing height*.
   On the wardrobe a distance *H* is shown. What is important about this?

1

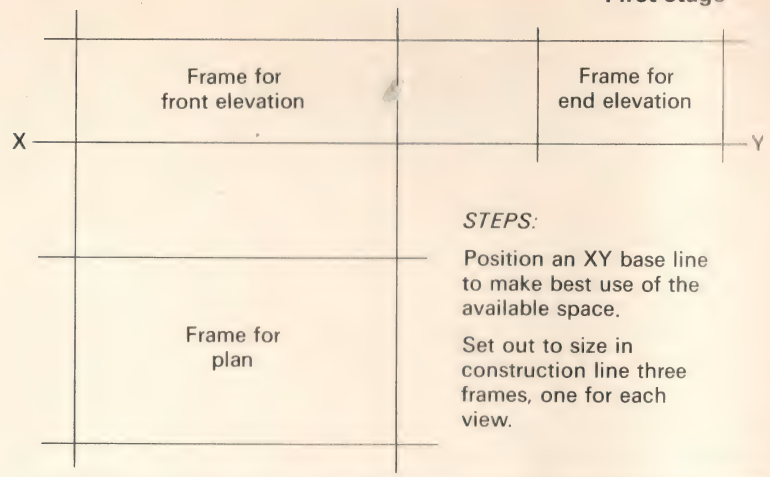
Matchbox to be drawn in orthographic projection



Size of box
60 × 35 × 20

2

First stage



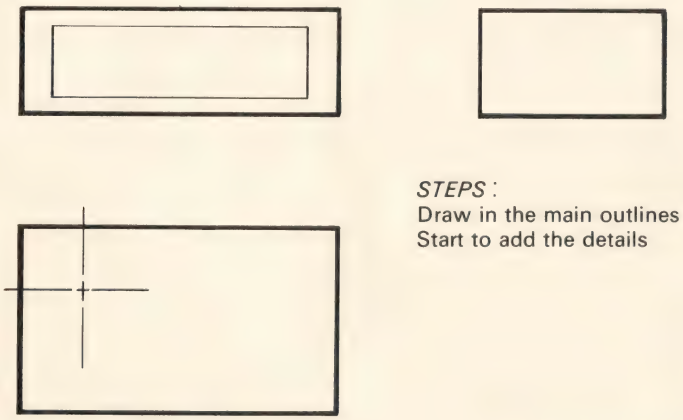
STEPS:

Position an XY base line to make best use of the available space.

Set out to size in construction line three frames, one for each view.

3

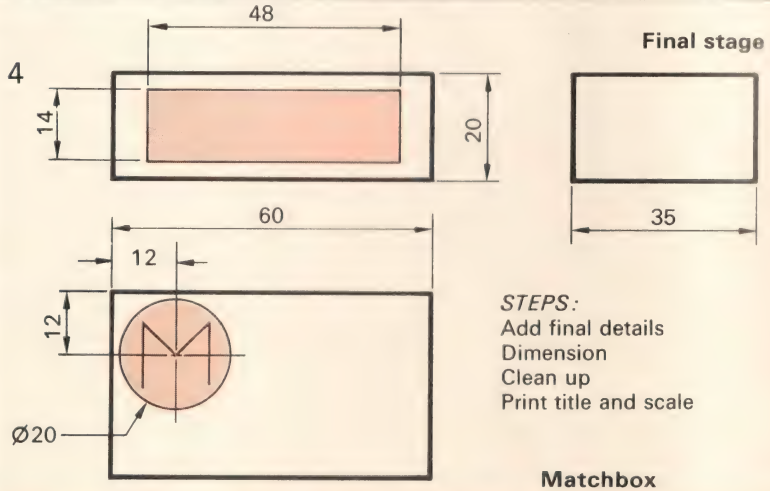
Second stage



STEPS:
Draw in the main outlines
Start to add the details

4

Final stage



STEPS:
Add final details
Dimension
Clean up
Print title and scale

Matchbox

SCALE 1:1

ORTHOGRAPHIC PROJECTION (1) — SHEET 17

This sheet and a few to follow introduce you to a vital system of projection by which you can draw the true views of an object in relationship to one another.

The pictorial view in Fig. 1 represents a matchbox with the smaller details omitted. Three sides can be seen in relationship, but they are distorted in size and shape. To obtain correct views of the sides, we must look squarely at each one.

The views we see could be drawn anywhere on the paper, but it is much better to project them at right-angles to one another for accurate reference and draughting economy. This method is in some ways similar to drawing in series.

For a more detailed explanation of orthographic projection, see Sheet 57.

Exercises

1. Divide your paper into four equal quarters. In the first quarter make a sketch of the matchbox.
2. In the second quarter plan out the position of the three frames. Leave wide spaces between them. Allow the frames to remain in construction line as a reference for the first stage of orthographic projection.
3. Copy the frames in Fig. 3, and then make a final completed drawing as in Fig. 4 in the fourth quarter. As you make this final drawing you will obviously pass through the two previous stages.

Note The repetition of the separate frames is not necessary for future drawings, but you should continue to pass through the stages they illustrate towards the single final drawing.

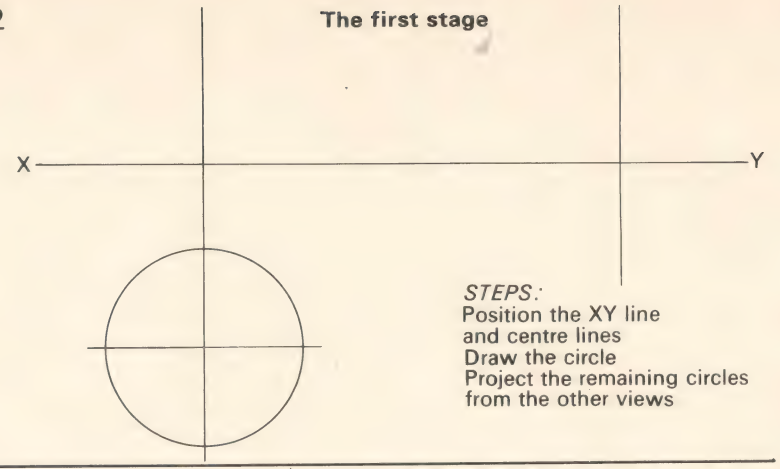
1

THE SKETCHES SHOW A RUBBER DOOR STOP.
WHEN DRAWING CIRCULAR OBJECTS FOLLOW THE GOLDEN RULE: **CENTRE LINES AND CIRCLES FIRST**

Sketch of a vertical section on the centre line

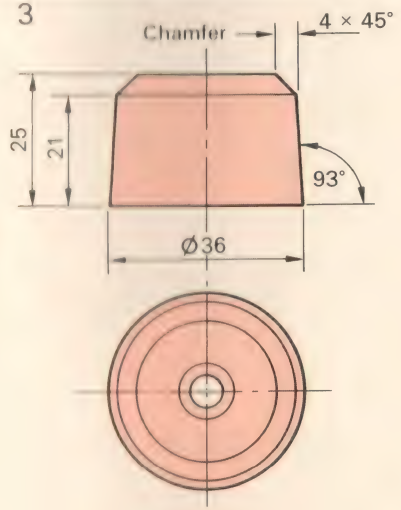
2

The first stage

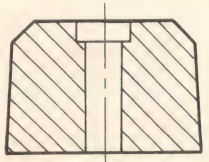


STEPS:
Position the XY line
and centre lines
Draw the circle
Project the remaining circles
from the other views

3



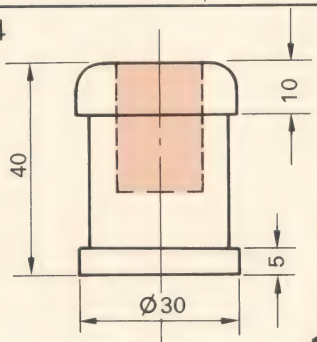
The final stage

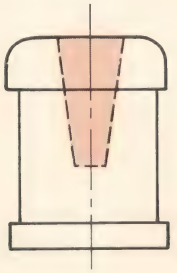


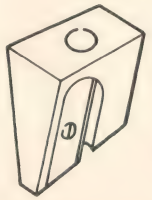
Vertical section
on centre line

Door stop

4







Cutter block

Pencil sharpener

SUPPLY DETAILS NOT GIVEN

ORTHOGRAPHIC PROJECTION (2) — SHEET 18

Many objects to be drawn orthographically are circular, and when drawing these it is often best to draw centre lines and circles first. Figure 2 shows this first stage in drawing the example of a door stop.

In the final drawing (Fig. 3), a section has been introduced into the work. Compare this with the section in Fig. 1.

Figure 4 shows the final drawings of a pencil sharpener with finer detail omitted. Hidden detail lines are used to represent the cutter block in position.

Exercises

1. Reproduce the sketches in Fig. 1 and the final drawing in Fig. 3.
2. Discuss the reasons why the door stop sides are at 3°.
3. Draw the pencil sharpener in Fig. 4, and sketch the cutter block.
   See if you can obtain the actual objects from which to make a drawing.

Sketch of a ceramic pot

A JOB TO MAKE

THE POT IS TO BE USED IN THE METALWORK SHOP AS A CONTAINER FOR SOLDERING FLUID OR FLUX PASTE. IT HAS BEEN FOUND THAT IT IS EASILY KNOCKED OVER. A QUICKLY MADE STAND IS REQUIRED WHICH WILL PREVENT THIS.

THE SKETCHES BELOW ARE A FEW IDEAS FOR SOME ROUGH 'KNOCK-UPS'

NOT DRAWN TO SCALE

ALL IDEAS SUBJECT TO IMPROVEMENT

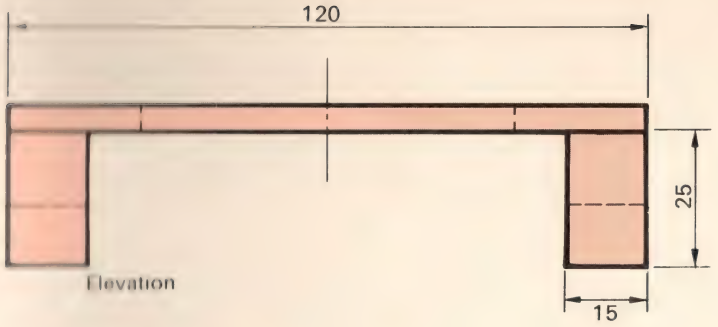
WORKSHOP POT STAND (1) — SHEET 19

The problem to be solved here is to design a stand that can be quickly made to prevent the pot from being knocked over. Some very rough solutions are indicated.

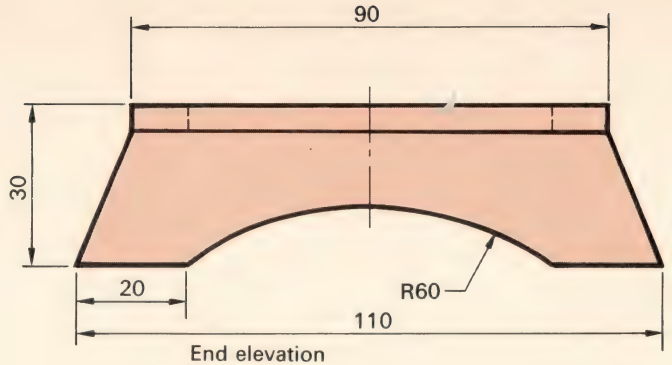
The design process is one of continued improvement, so you certainly should not accept the first ideas which come into your head. Always, when trying to find a solution to a design problem, sketch out your ideas—however rough they may be—then follow with improvements. You can sometimes sketch an idea on the backcloth of your mind, but it is advisable to work out all your better ideas on paper. Select the idea which is more suitable than the others and then perfect it as far as you can.

Exercises

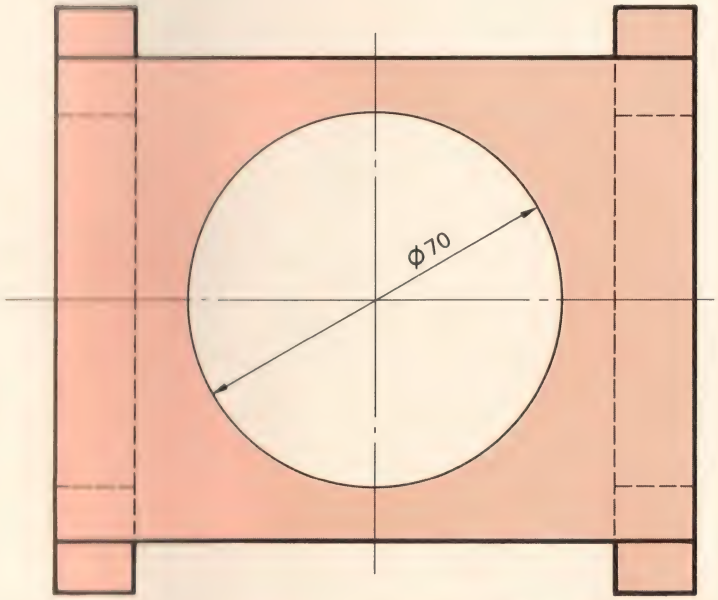
1. Sketch alternative ideas for the pot stand, following those given on Sheet 19.
2. Draw the stand orthographically as shown on Sheet 20.



Elevation



End elevation



Plan

THIS IS AN IMPROVED IDEA FROM A SKETCH ON **SHEET 19**. *IT HAS BEEN DRAWN ORTHOGRAPHICALLY FOR GOOD QUALITY OF PRESENTATION*

IN THE WORKSHOP, SUCH AN ARTICLE MAY BE MADE FROM A SKETCH OR EVEN FROM A MENTAL IMAGE—A PICTURE IN THE HEAD—BUT AT THIS STAGE IT IS HELPFUL TO MAKE A PROPER DRAWING

CUTTING LIST (net sizes)

No.	PART	MATERIAL	SIZE
2	FEET	PINE	110 × 25 × 15
1	TOP	PLY	120 × 90 × 5

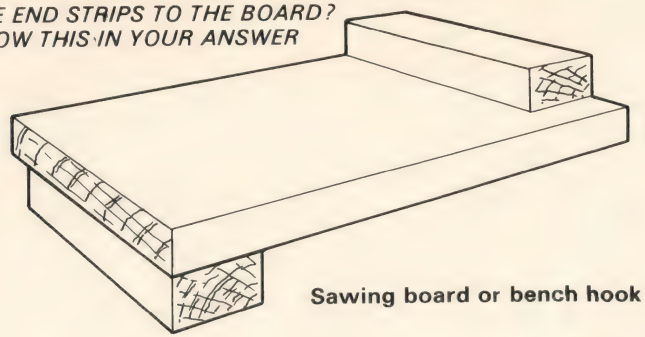
WORKSHOP POT STAND (2)

SHEET 20

THESE DRAWINGS OF FAMILIAR OBJECTS ARE IN PERSPECTIVE. DRAW THEM ORTHOGRAPHICALLY. EXAMINE THE REAL THINGS, IF POSSIBLE. SUPPLY ALL DIMENSIONS AND DETAILS

1

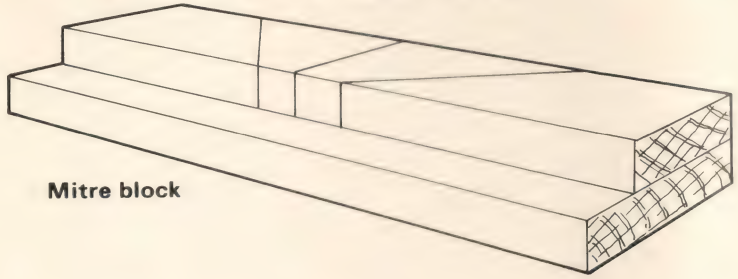
WHAT IS A GOOD WAY OF FIXING THE END STRIPS TO THE BOARD? SHOW THIS IN YOUR ANSWER



Sawing board or bench hook

2

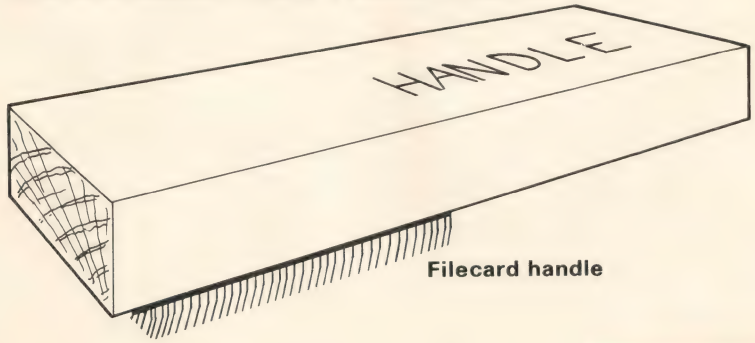
SHOW HOW YOU WOULD FIX THE TOP TO THE BOTTOM. WHAT ARE THE ANGLES OF THE SAW CUTS?



Mitre block

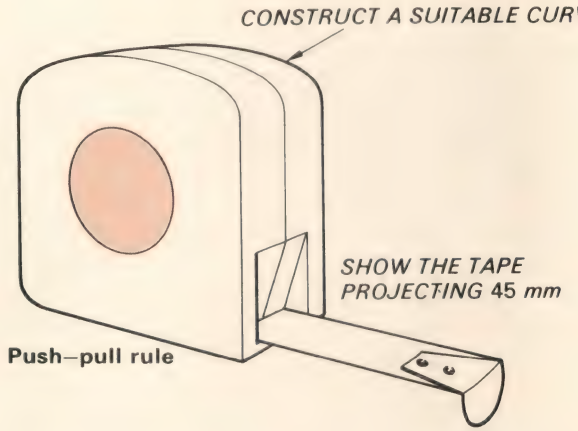
3

FILECARDING MUST BE FIXED TO A BLOCK BEFORE IT CAN BE USED. ON THE PIECE OF WOOD ILLUSTRATED DESIGN A HANDLE TO GIVE A COMFORTABLE GRIP



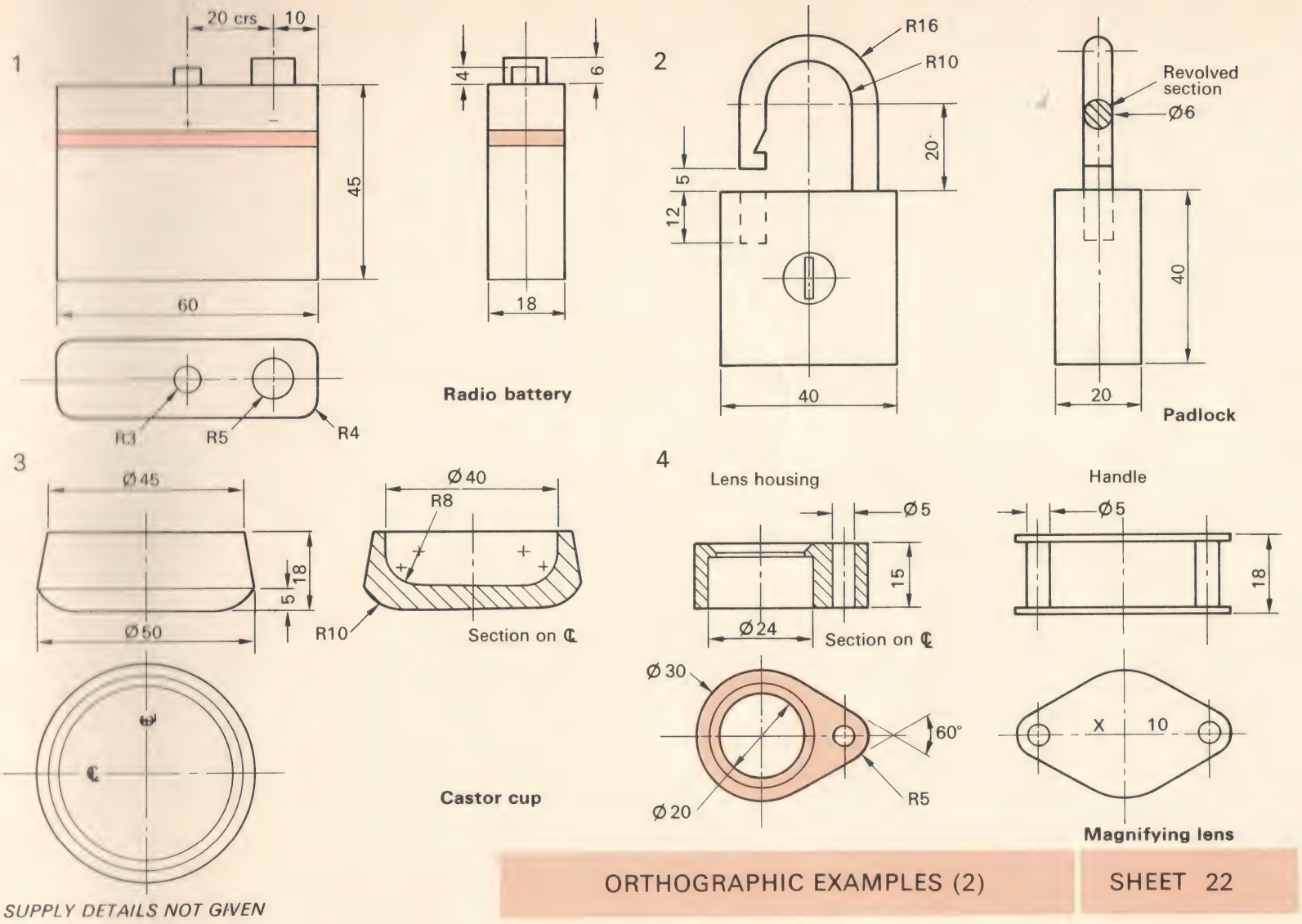
Filecard handle

4



ORTHOGRAPHIC EXAMPLES (1) SHEET 21

Draw the illustrated objects, giving each a plan, front, and end elevation. Use a half-scale for Figs. 1 and 2. Determine suitable dimensions. Fixing methods may be shown by separate sketches.

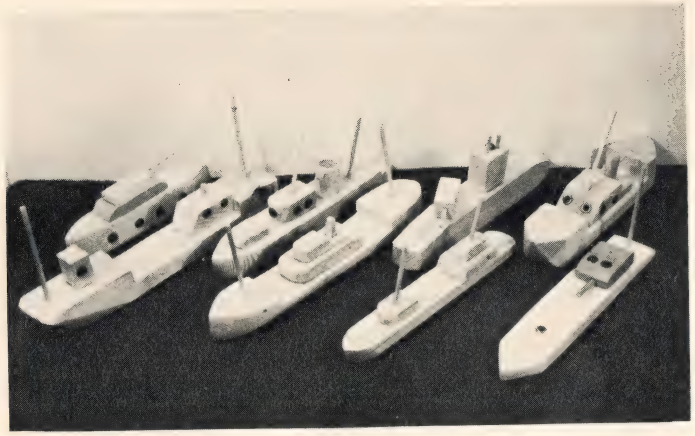


ORTHOGRAPHIC EXAMPLES (2) SHEET 22

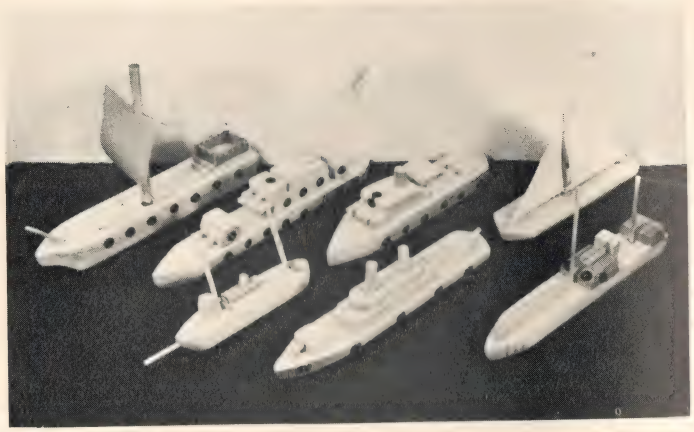
The objects have been drawn with their finer details omitted for simplicity. The handle and lens housing in Fig. 4 are separated from each other. When assembled the housing revolves into the protecting case formed by the handle.

Exercises

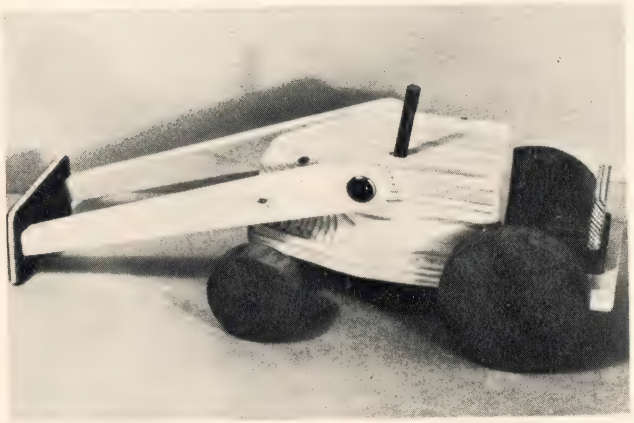
1. To twice the given sizes (a scale of 2:1), draw Figs. 1 to 4 and their given views, adding a plan to Fig. 2.
2. To a scale of 2:1, draw a vertical section through the assembled lens housing and handle with the lens housing in the fully-open position. Do not section line the handle and lens locating pin as it passes through the lens-housing hole.



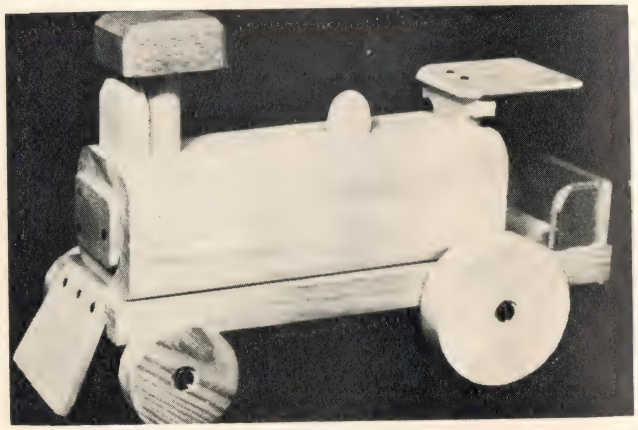
1



2



3

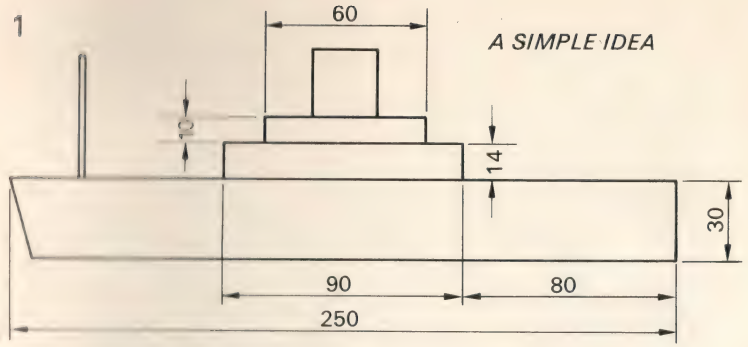


4

PHOTOGRAPHS SHEET 23

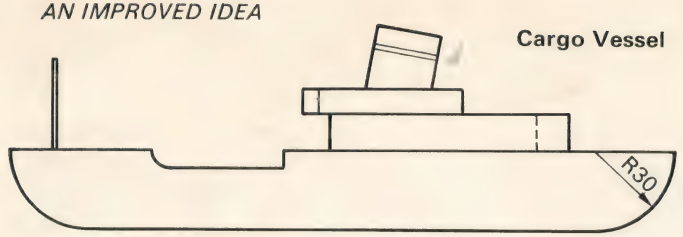
Boys aged 12 to 13 years designed and made these toys in the woodwork room. They are simple designs which have given satisfaction to their designers and pleasure to their young owners.

1 *A SIMPLE IDEA*



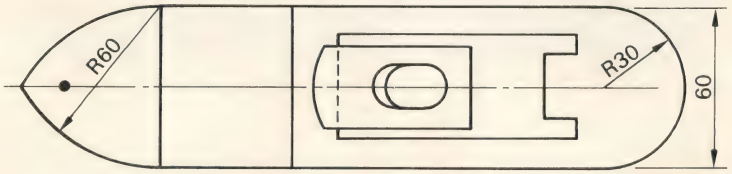
2 *AN IMPROVED IDEA*

Cargo Vessel



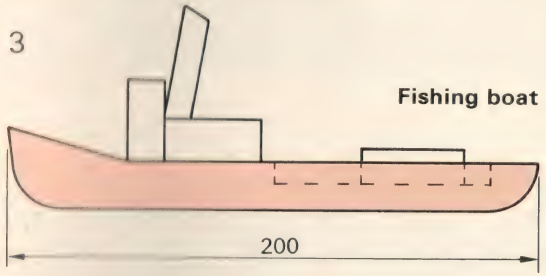
Elevation

Plan



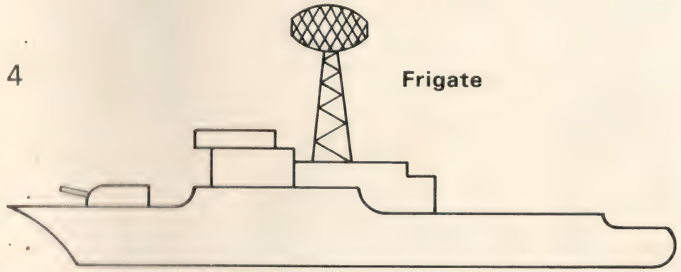
3

Fishing boat



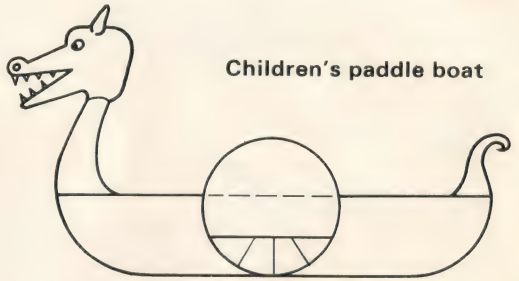
4

Frigate



5

Children's paddle boat



TOY BOATS — SHEET 24

The series shows side elevations of toy boats which can be made easily in the woodwork room and which young children will like to play with on the carpet or in the bath. They are not, therefore, models of real ships, but they can be made to look sufficiently like ships of various kinds to appeal to children.

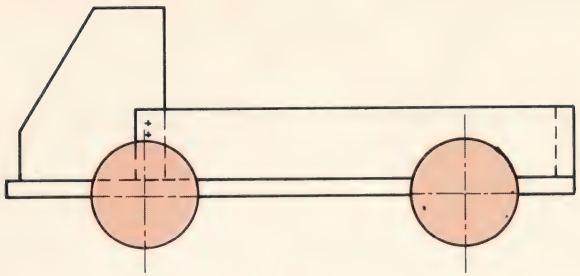
Notice how the same blocks in Fig. 1 appear in a more attractive arrangement in Fig. 2. A good rule is to decrease the thickness of the blocks as the decks become higher. Every addition to the hull must be planned thoughtfully—every piece must show an idea in its shape.

In case you are thinking that you are too old to play with toy boats you should be reminded that you are designing them, and that is quite a different matter. Many professional designers are employed by toy manufacturers especially for this purpose.

Exercises

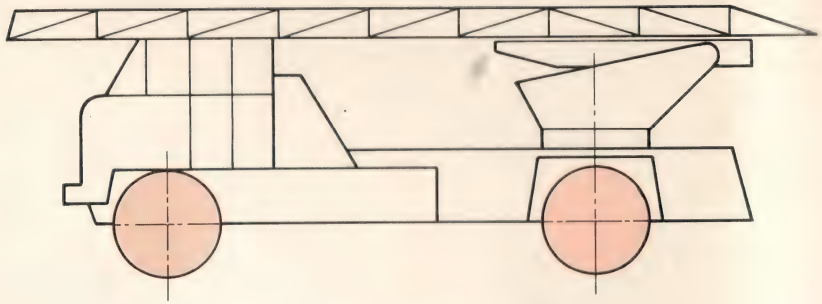
1. Supplying all the sizes not given on the sheet, draw a closely similar series. Put in your own ideas where you wish, provided they result in improvements.
2. Using your own ideas entirely, design another ship. Make rough development sketches; an elevation and plan in orthographic projection; and a pictorial sketch of the finished design.
3. On another sheet of drawing paper, make separated working drawings of all the individual parts in your design for Exercise 2. Use plans, elevations, and sections where necessary, and fully dimension (see Sheet 26 for explanations of a parts drawing).
4. If you were actually making the boat, would you think it necessary to paint it? If so, what kind of paint would you *not* use?
   What kind of glue should be used?
   Would a mast on a toy boat be a possible danger to young children?
5. Design a series of alternative figure-heads to the Viking dragon-head shown in Fig. 5. Make your ideas appealing to all children, some for boys and some for girls. Assume that the heads are to be used on boats on a pleasure-ground boating lake.

1



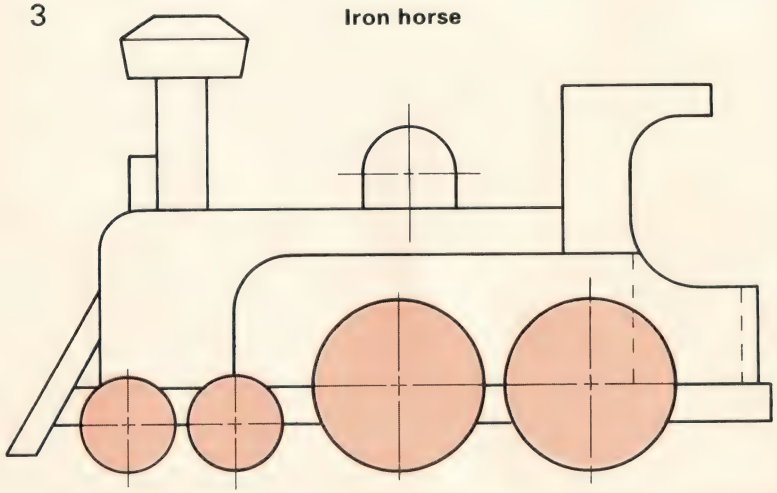
Simply made lorry

2

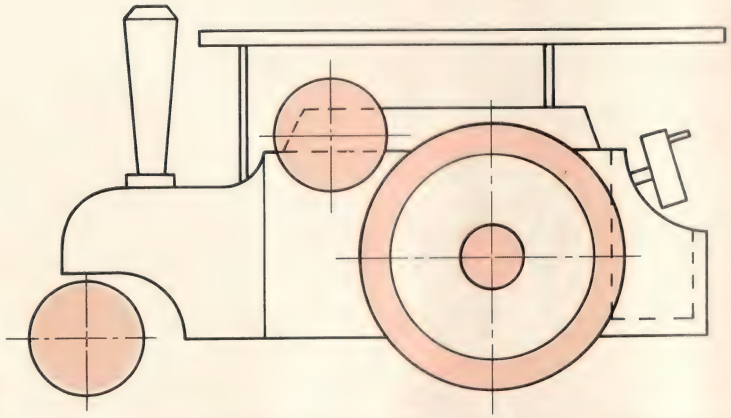


Fire engine

3 Iron horse



4 Steamroller



NOT TO SCALE SUPPLY DETAILS NOT GIVEN

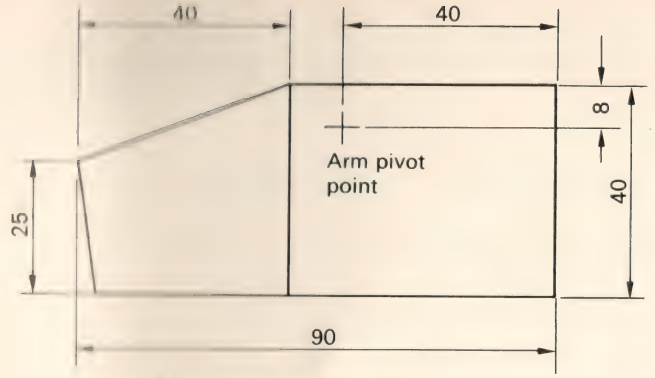
WHEELED TOYS SHEET 25

It requires only a few strips, a simply shaped block of wood, and some dowel sections, to make the lorry shown in Fig. 1. The lorry is an effective toy for toddlers. Other, more complex, ideas are shown in Figs. 2, 3, and 4.

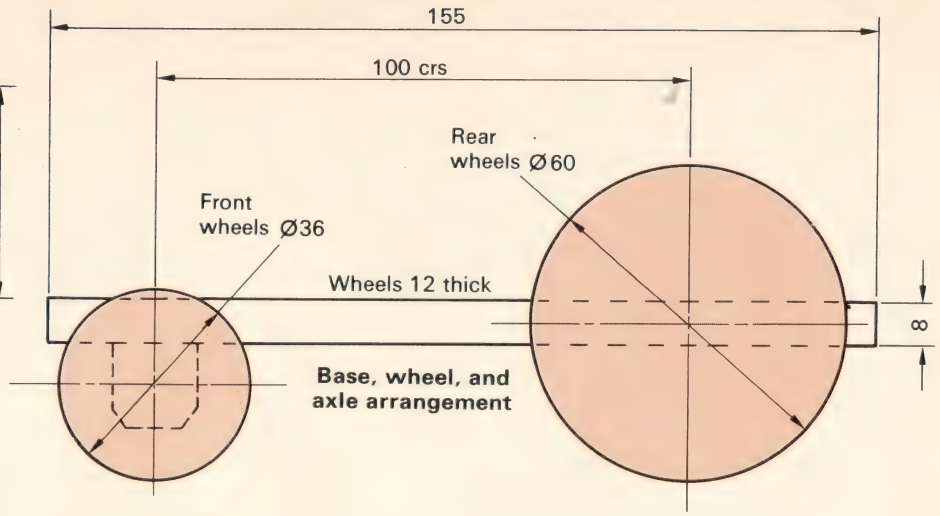
The drawing for the fire engine was taken from a die-cast metal model, and it would not be practicable to make it in wood as illustrated.

Exercises

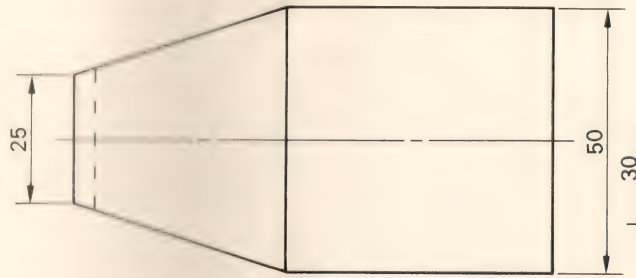
1. Draw a series of side elevations of similar toy vehicles which are likely to appeal to small children. You may use the given examples as the basis of your ideas, or design different ones.
2. Redesign the fire engine so that it can be made in wood. Eliminate all sharp corners, weak or complicated features. Draw a front elevation and add a plan or end elevation as necessary to show the construction clearly.
3. Design a fitting in mild steel which will contain the front roller of the steamroller, fasten it to the body, and allow it to pivot.

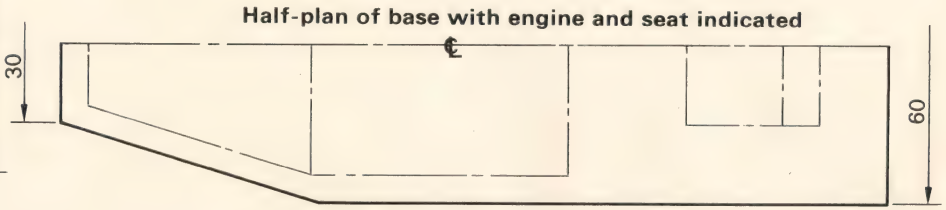


Engine block



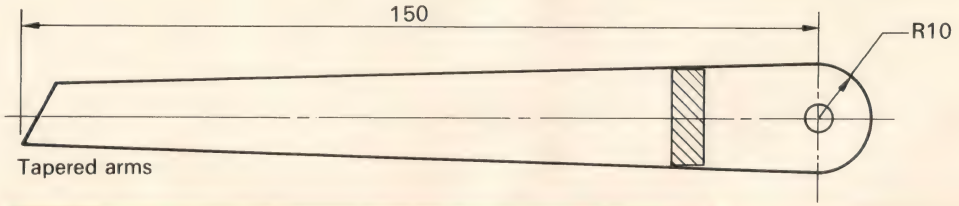
Base, wheel, and axle arrangement





Half-plan of base with engine and seat indicated

COMPLETE THE DESIGN BY ADDING YOUR OWN IDEAS FOR THE BLADE, SEAT, AXLE, AND EXHAUST



A SEPARATED PARTS DRAWING

SUPPLY DETAILS NOT GIVEN

BULLDOZER SHEET 26

A *working drawing* is a drawing from which a craftsman can obtain all the information necessary for making an object. Where there is more than one part, individual parts are drawn separately for clarity. Each part may be drawn with one or more views or sections as additional explanation. A drawing which shows all the parts in their final assembled positions is called an *assembly drawing*.

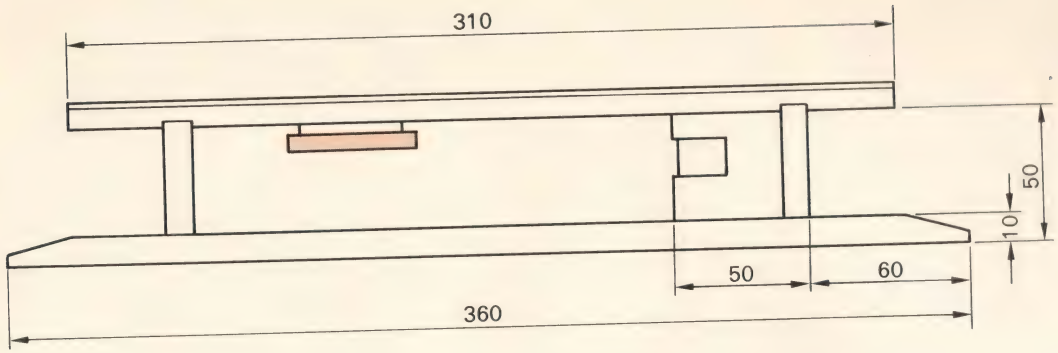
Sheet 26 shows a working drawing based upon the toy shown in photograph 3 (Sheet 23). It is an example of how to arrange the separate parts for the purpose of showing all working details of an article. Notice how as many parts as possible are drawn in line with one another, and the indicated positions of the engine and seat.

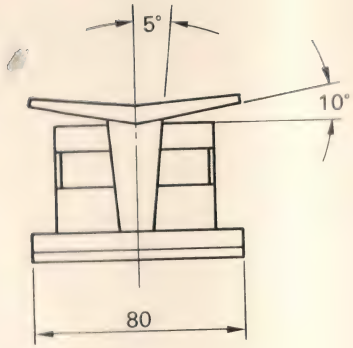
Some minor details, however, have not been included, so that you may contribute to the design.

Exercises

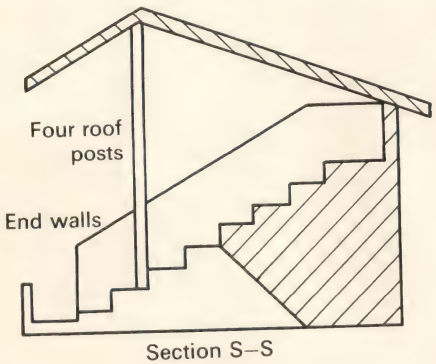
1. Copy the given parts on larger paper, allowing more space between views and supplying all details of the parts not illustrated.
2. Make a full-size assembly drawing showing three orthographic views of the bulldozer. Include overall dimensions only.
3. Study photograph 4 (Sheet 23), and use this as the basis of a working drawing for this steam-engine design. You may make improvements, if you wish.

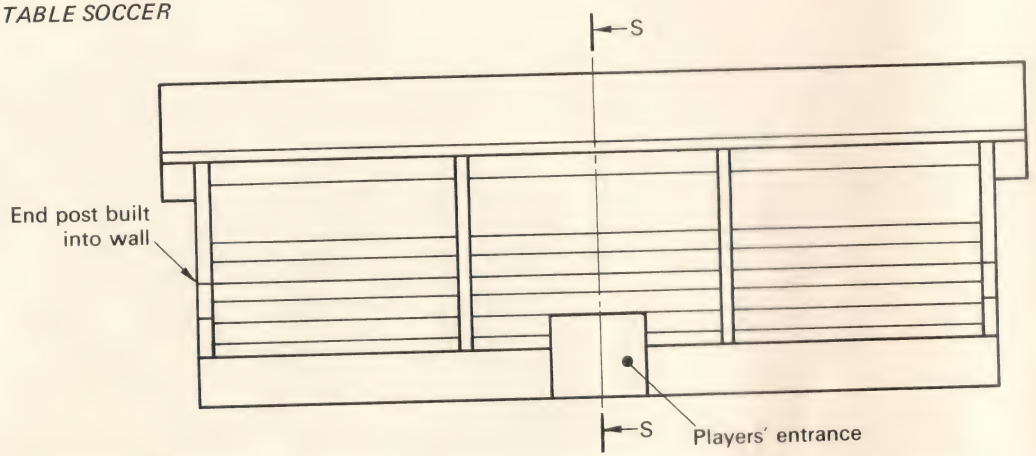
1 **Station platform** *(FOR USE WITH A MODEL RAILWAY)*





2 **Spectators' stand** *(FOR USE WITH TABLE SOCCER*





SUPPLY DETAILS NOT GIVEN

MODEL BUILDINGS SHEET 27

A model building on a railway layout, or for part of a boy's hobby activity or game, will enhance appearance and add to enjoyment. Model buildings can be designed and made for such accessory purposes in the school drawing room and workshops. They should be made to the same scale as the main components.

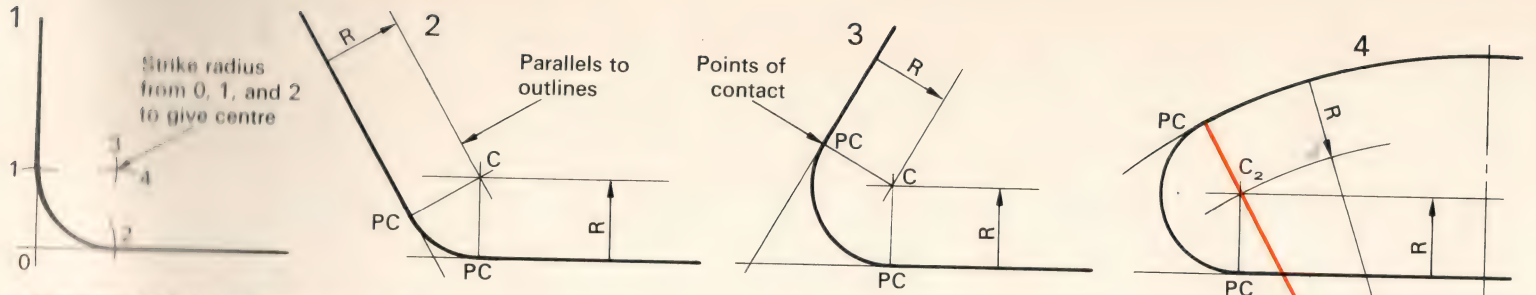
Figure 1 shows a simple design for a station platform. Most of the dimensions have been given.

The spectators' stand in Fig. 2 is not drawn to scale, but it provides a basic idea for you to follow or improve.

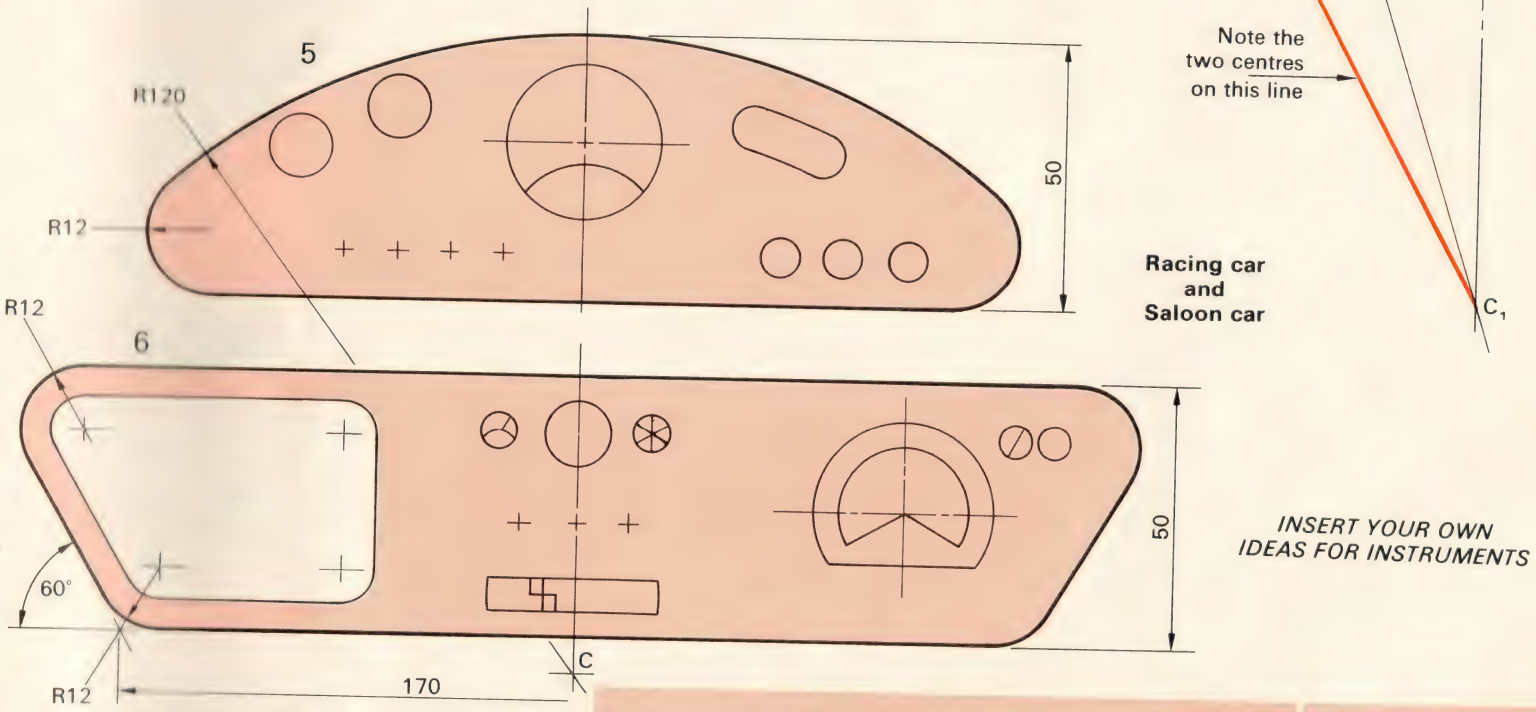
Exercises

1. Draw the station platform to the scale and sizes given. Without using hidden-detail line, add a plan.
2. Using Fig. 2 as the basis of your design, or designing a completely different model from your own ideas, make a scale drawing for a spectators' stand.
3. Make drawings to show the design of one of the following buildings, suitable in scale for a model-railway layout and made mainly in wood:

parish church; windmill; service station; factory; airport control tower.



Methods of joining lines and arcs



Racing car and Saloon car

INSERT YOUR OWN IDEAS FOR INSTRUMENTS

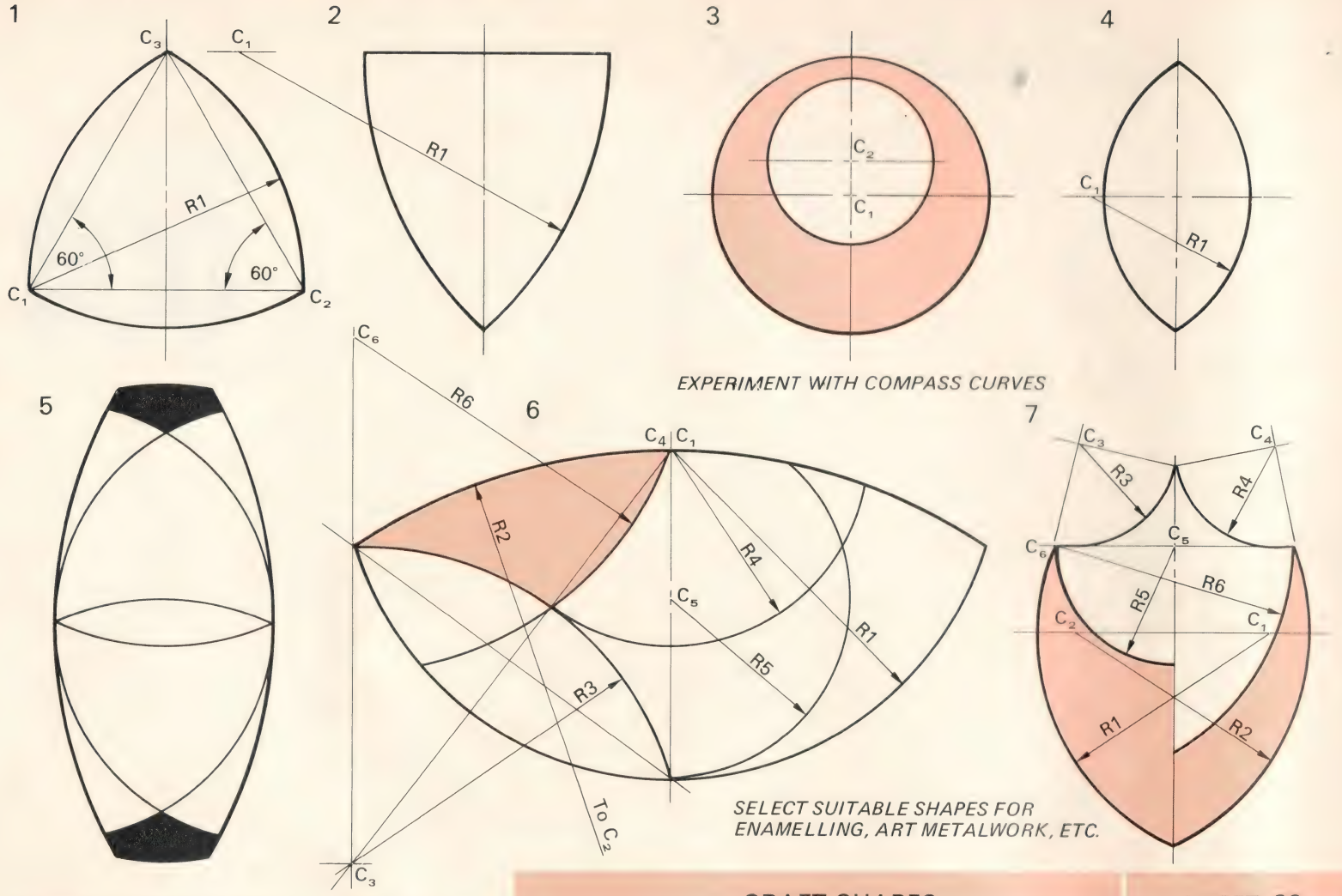
CAR DASHBOARDS

SHEET 28

There are as many different styles of dashboards as there are makes of motor vehicles, but all aim to present the most important instruments in front of, or in full view of, the driver. Light switches must be easily accessible, but a glove compartment can be to one side.

Exercises

1. Study and draw the geometrical examples in Figs. 1 to 4.
2. Draw the examples in Figs. 5 and 6. Neatly label all the instruments or switches, or make an identification key.
3. Obtain manufacturers' literature or advertisements from showrooms, magazines, or newspapers. Study the layouts of these real examples. Record by sketching.
4. Pursue a small project on the design of other kinds of instrument panel. Consider examples from a gasmeter to a spacecraft.



CRAFT SHAPES

SHEET 29

Craft shapes are compass-constructed shapes which could be used in enamelling, beaten metalwork, or art metalwork.

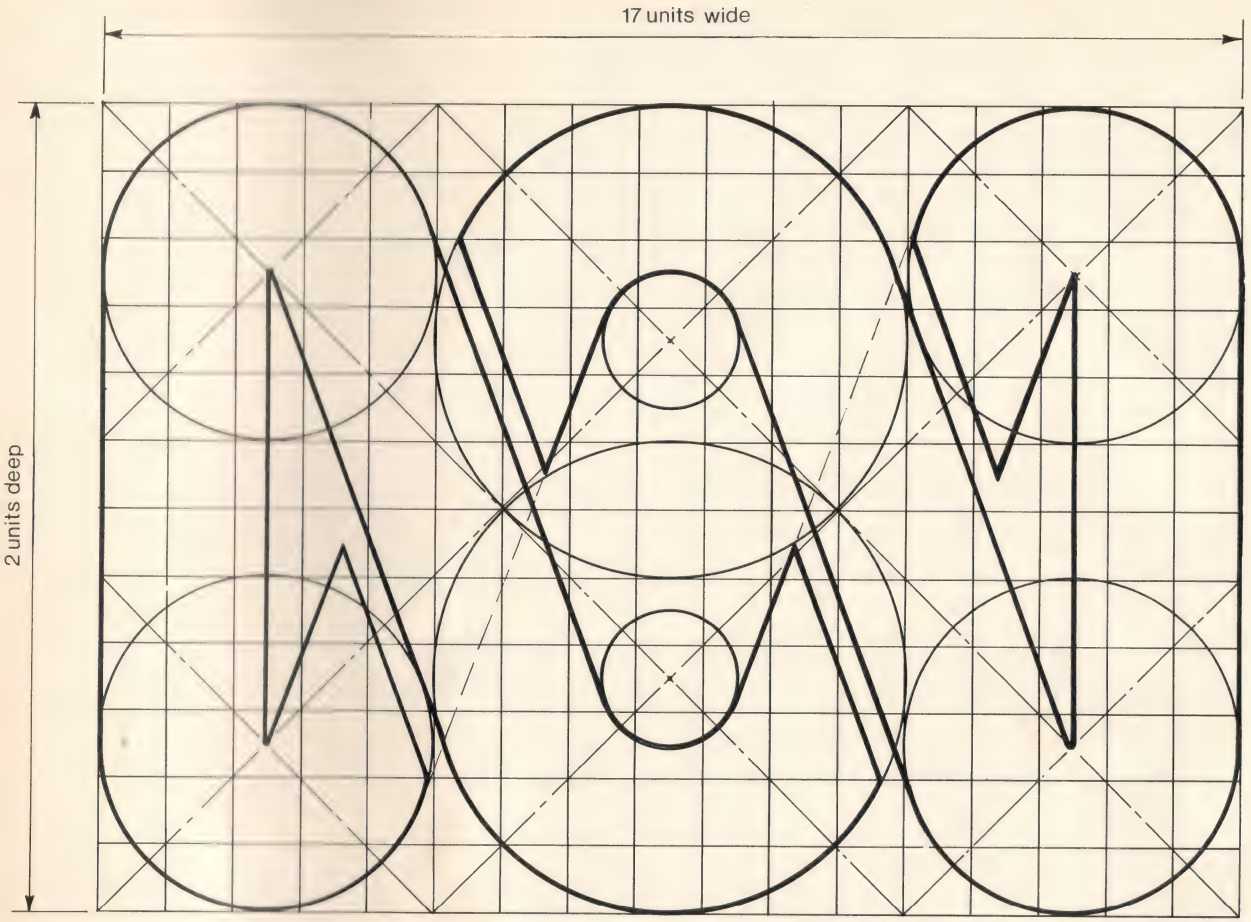
The shapes are of single outline with others which have been experimentally overdrawn to produce shapes within shapes and modifications of shape.

Exercises

1. Carefully draw and dimension closely similar shapes.
2. Experiment in the design of your own shapes.

Look for pleasant shapes inside the larger ones, such as the one at the top and bottom of Fig. 5.

3. When you have found a good shape, identify it by colour shading.



ABC·TV

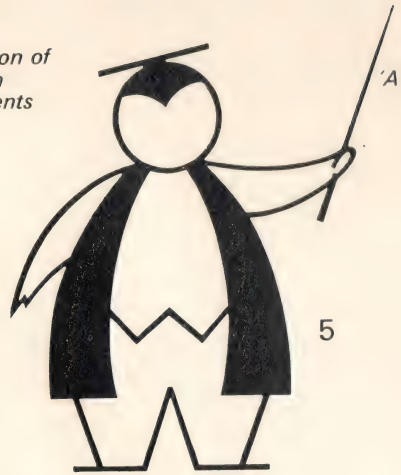
The ABC SYMBOL

Method:

1. Draw up the grid of squares, 12 units deep, 17 units wide.
2. Find the centres for the six circles.
3. Draw in the circles.
4. Draw tangents to the circles where indicated.
5. Complete the symbol by selecting the relevant lines.

TRADE SYMBOL | SHEET 30

1



'ATTENTION PLEASE!'

5

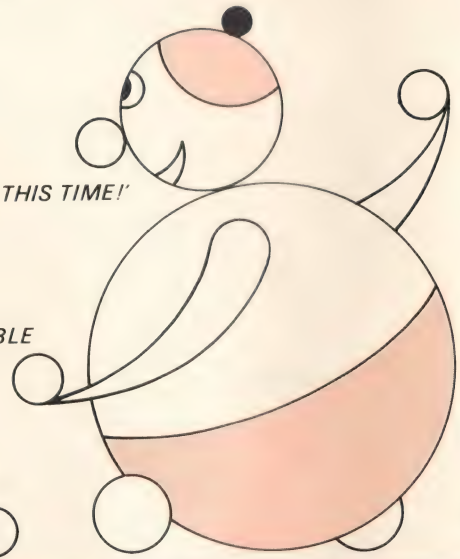
2

'MISSED AGAIN!'

3

'GET YOU THIS TIME!'

CAN YOU THINK OF A SUITABLE PICTURE TITLE?



4

FUN FIGURES

SHEET 31

By using your compasses with a little imagination, humorous figures such as the ones shown can be drawn. No complicated geometry is required, simply centre an arc according to your judgement.

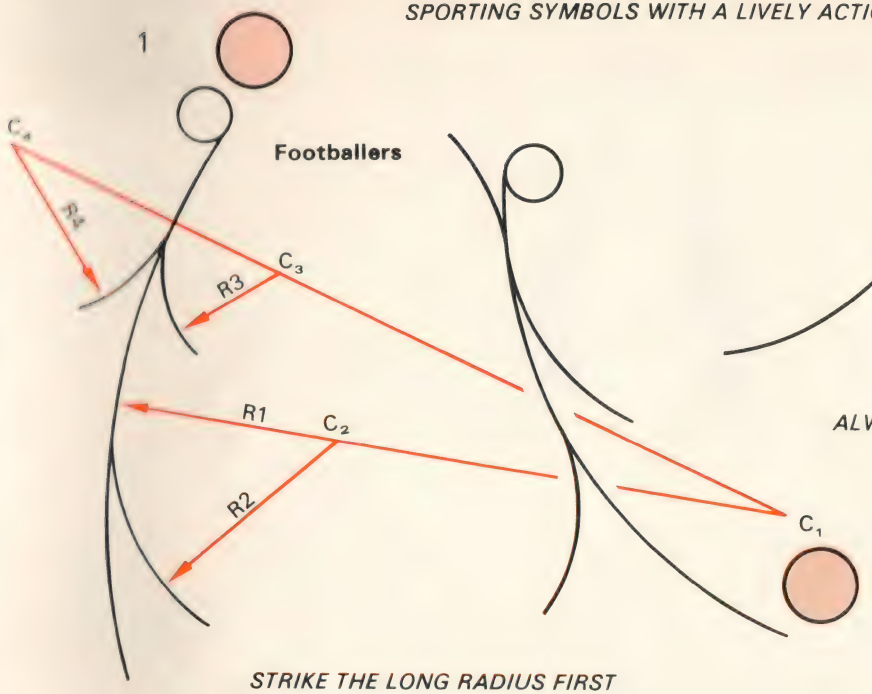
The main figures appear in an action situation which has been designed to amuse very young children.

Exercises

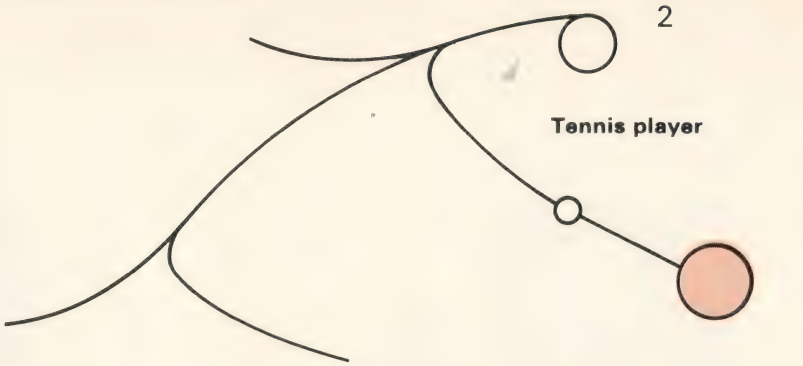
1. Complete a series of small, experimental figures similar to those in Figs. 1 and 2.
2. Make closely similar drawings to the main characters in Figs. 3 and 4, adding colour to improve.
3. Show the main characters in a series of situations which may capture the imagination of a young child.
   For example:
   (a) a sledge run and tumble;
   (b) skating;
   (c) a holiday scene;
   (d) a tea party.

   Add humorous remarks as part of the exercise.
4. Design a companion character to 'Mr Record', shown in Fig. 5.

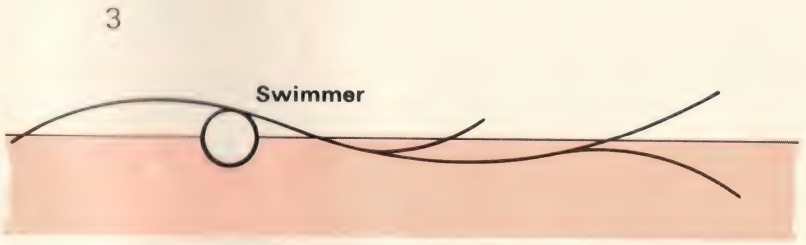
SPORTING SYMBOLS WITH A LIVELY ACTION LINE

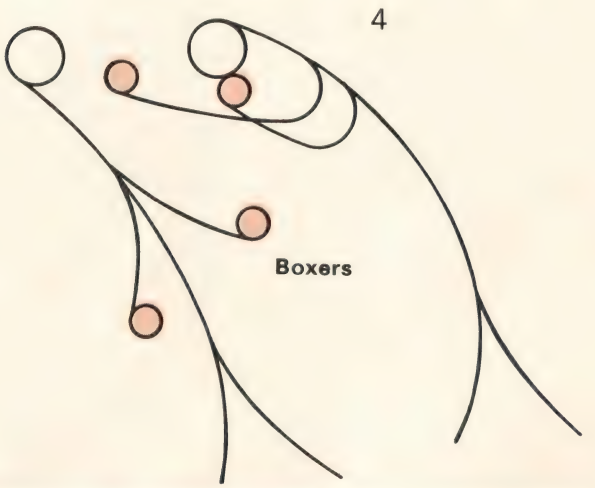


STRIKE THE LONG RADIUS FIRST



ALWAYS SKETCH YOUR IDEAS BEFORE USING INSTRUMENTS





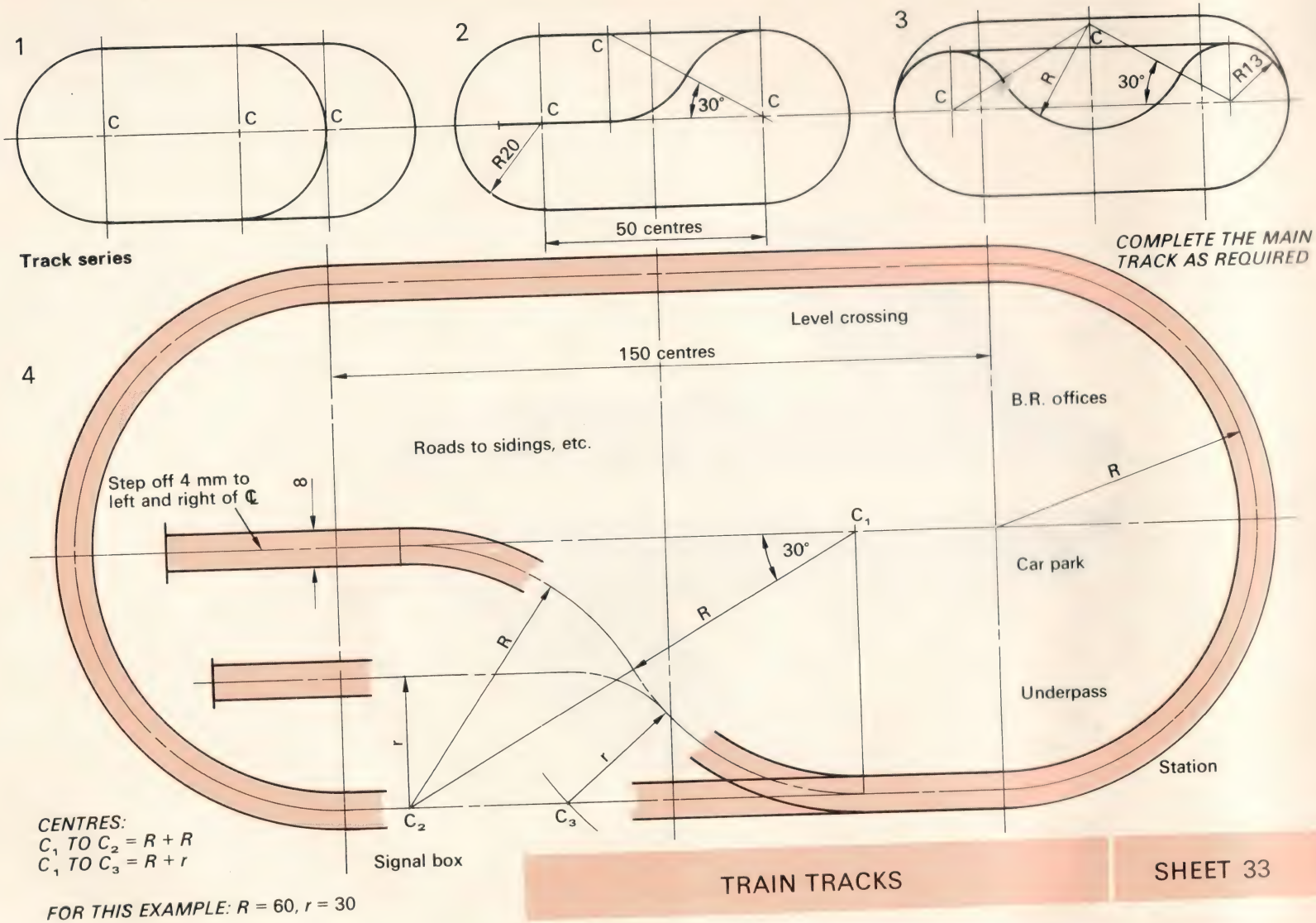
COULD YOU DESIGN A SERIES TO COVER THE OLYMPIC GAMES?

ACTION MEN — SHEET 32

The figures are composed of arcs and circles in contact. Some of the arcs have quite long radii and you may need a compass extension bar.
All the centres in Fig. 1 have been shown to help you to start drawing the examples.

Exercises

1. Draw the figures in your own style. Start with the longest line of the body represented by the longest arc.
2. Sketch out other ideas on scrap paper, and then draw another series of your own invention. Aim for a lively 'action line'.
3. Design a series of visual symbols which could be used as location signs for the various sporting pavilions or arenas at a large recreation centre.
   You need not confine your answer to the use of curves only.
   Make your symbol intelligible to people who cannot understand the English language, as could happen in international events.
   See if you can obtain copies of the sport symbols used in the Olympic Games.



TRAIN TRACKS

SHEET 33

Whether in real life, play, or hobby situations, there can be much interesting curvilinear geometry in the design of railway tracks for both pupils and other modelling enthusiasts.

The series 1 to 3 on the sheet shows three tracks, each of the same overall size. This may have to be the case if a model-train enthusiast has limited room or length of alternative track.

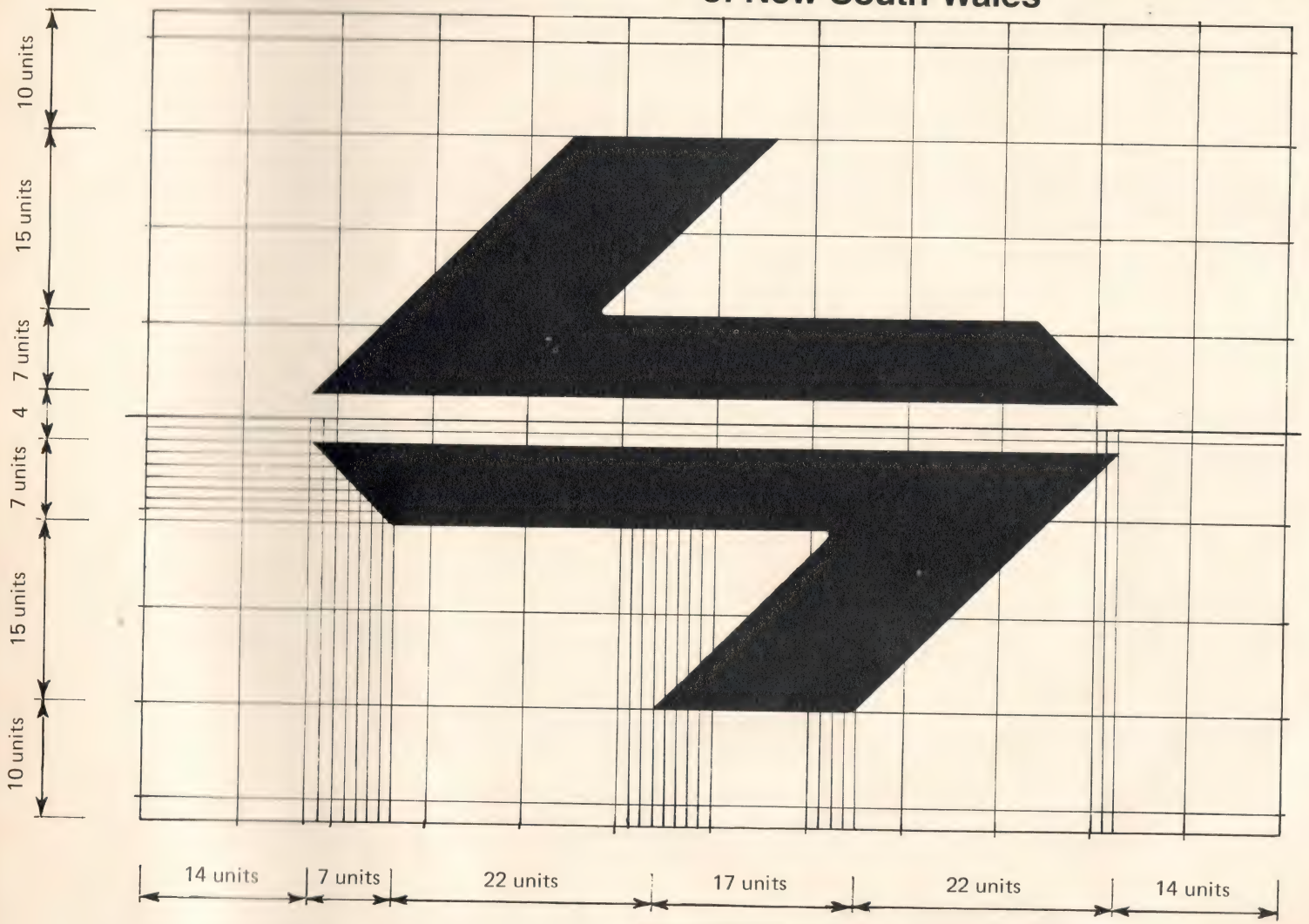
The main drawing shows the track firstly set out in centre line, followed by expansion into the full track. The area which shows the geometry for the sidings has been left in centre line for clarity.

Exercises

1. Accurately draw the track series as given, adding three others of your own design.
2. Draw and complete the main track in Fig. 4.
   At or near the places indicated, draw the plans of the items required. Assume that the track is for an electric train and is to be fitted upon a chipboard base. Consider the use of building plans in coloured card for repositioning purposes.
3. Make development sketches and a final layout drawing of a track for model cars.

Reproduced by permission of the Public Transport Commission with grateful acknowledgements

Public Transport Commission of New South Wales



The symbol is constructed by means of a grid which is divided into units, the relative spacing is marked on the grid. Angles are 45° to the horizontal, with a radius at the inside angle of each section.

NOTE THAT THE OUTER ARROWS BROADEN SLIGHTLY TOWARDS THEIR TIPS

TRADE SYMBOL

SHEET 34

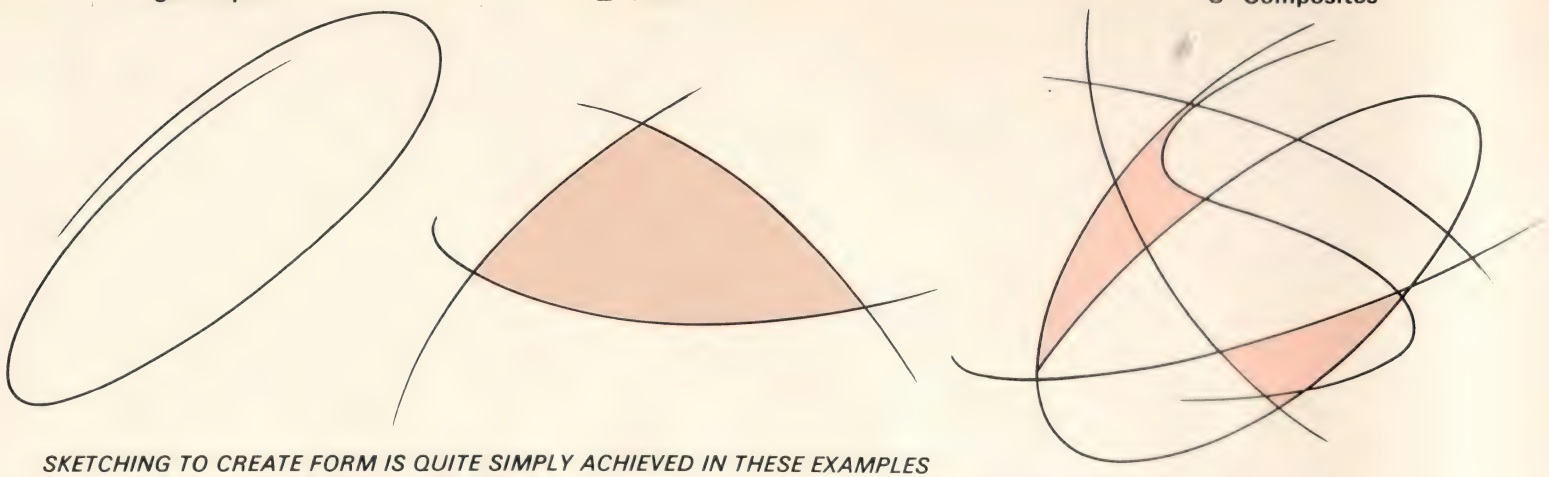
The angular lines represent traffic movement and direction. The symbol is particularly suitable to the modern image of the Public Transport Commission and depending on application, can be seen in the following forms:—

(i) Dark blue top section, bottom section light blue.
(ii) Contained in a dark blue rectangle, top section white, bottom section pale blue.
(iii) A reversed panel version as illustrated at the top of the page is generally used when printing black and white, or single colour, in publications.

1 **Single loops**

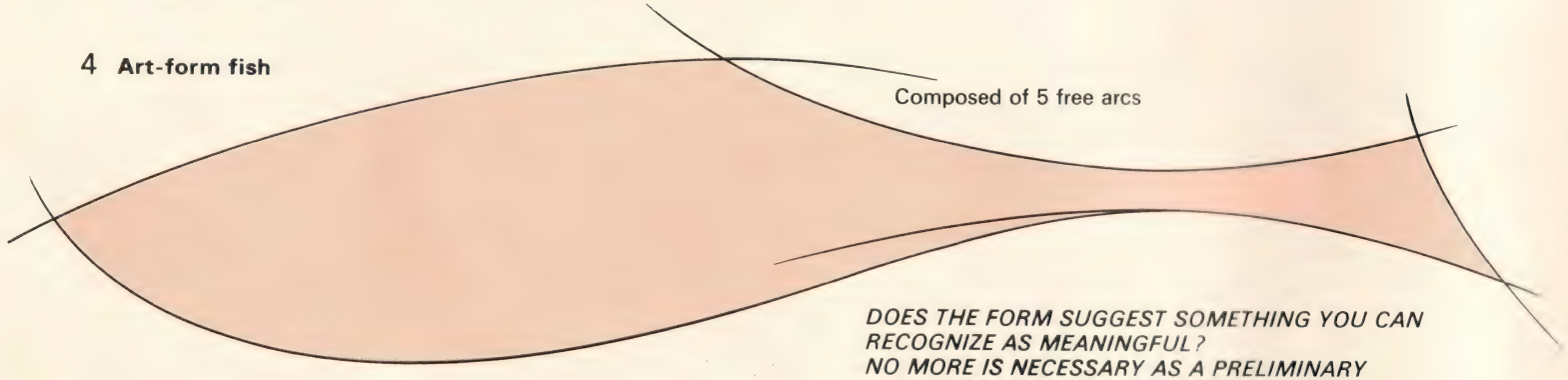
2 **Arcs**

3 **Composites**



SKETCHING TO CREATE FORM IS QUITE SIMPLY ACHIEVED IN THESE EXAMPLES
TRY QUICK MOVEMENTS AND LARGE SWEEPS
OBTAIN A BASIC IDEA FOR FURTHER IMPROVEMENT

4 **Art-form fish**



DOES THE FORM SUGGEST SOMETHING YOU CAN RECOGNIZE AS MEANINGFUL?
NO MORE IS NECESSARY AS A PRELIMINARY TO A WORK OF ART OR CRAFT

KEEP YOUR LINES SMOOTH AND FREE-FLOWING, ELIMINATE FUSSY DETAIL, AND PRESERVE INTEREST BY VARYING CURVES AND AREAS

ART FORMS (1) SHEET 35

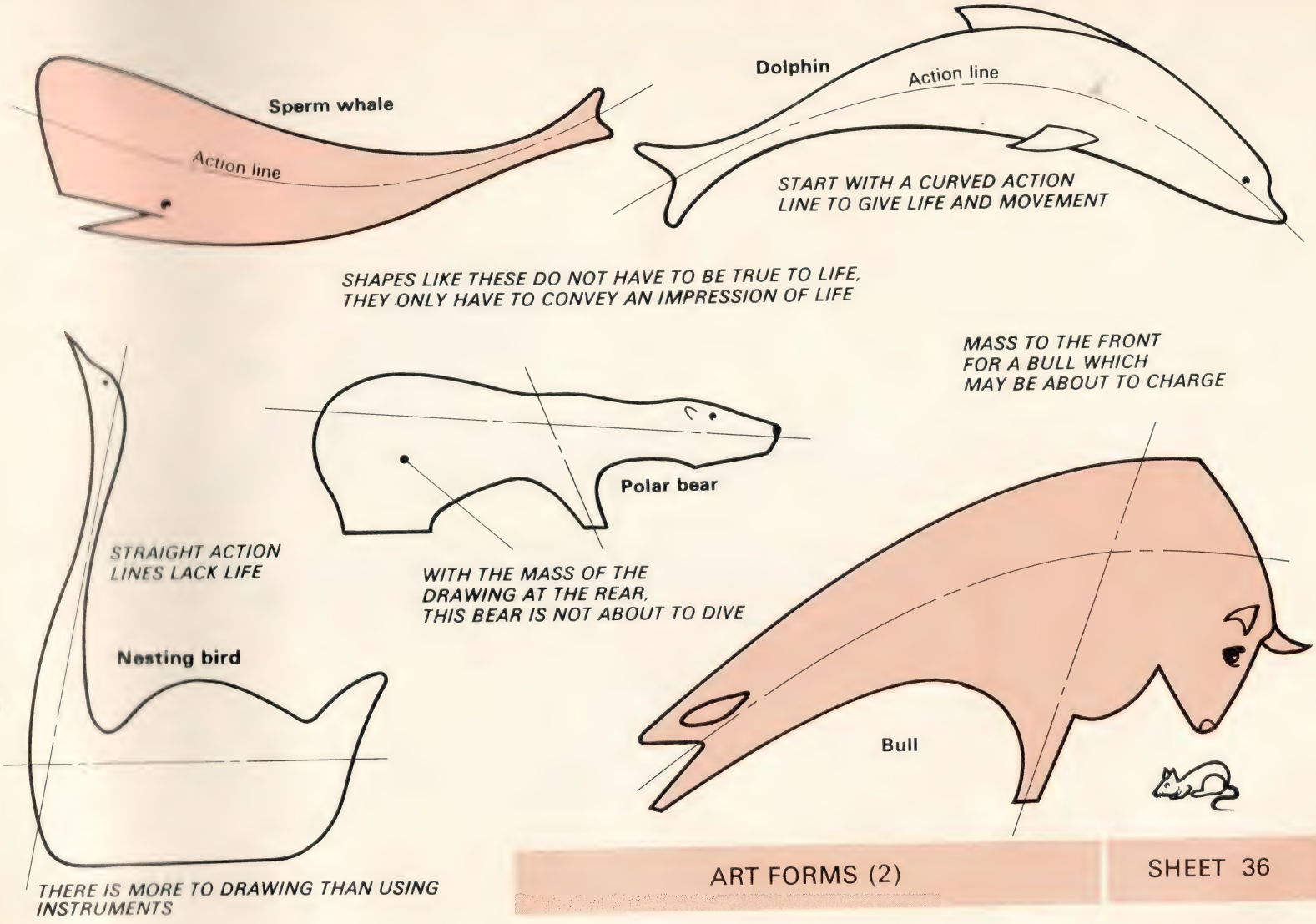
Art-form shapes should all be drawn *freehand*. Sketching art and craft shapes in this way is part of the design process, and also of graphic communication.

Single loops. This is an elementary free-shape which should be easy enough for you to do with a quick swirl of the hand. Do not try to copy the shape. Simply draw a few of your own with a soft pencil.

Arcs. The form comprises three simple arcs dashed across the paper—without being too fussy as to the result. If you make the arcs intersect, they will produce a fairly good free-shape—for use on a pendant, perhaps. If you don't like what you see, then draw a few more until you do.

Composites. In this figure, a letter 'S' has been overlaid with a loop and three arcs. Look carefully inside the figure to identify useful shapes.

Art form. The five quickly-slashed arcs in Fig. 4 were intended to create a fish shape. Have they done so? Have they, at least, given us a good start towards a better shape? Design a series of fish shapes.



ART FORMS (2) SHEET 36

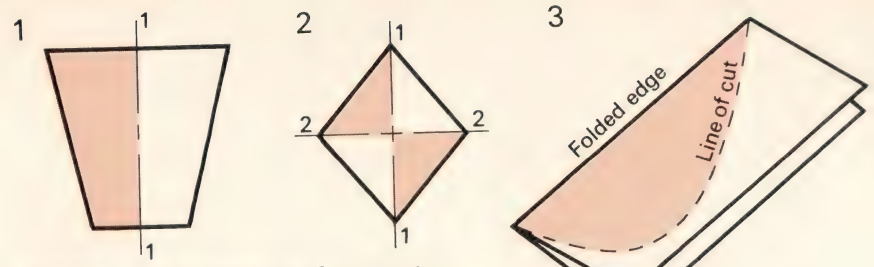
All the art-form shapes have been sketched and improved, as indicated on Sheet 35. Notice the lively effect of a good action line.

Shapes like these cannot really be copied, they must be shapes which you feel something about—they must come from your inspired imagination.

You must also sketch an art form bearing in mind the material out of which the object is to be carved or fabricated. For example, there should be no short grain on wooden figures; no sharp points on metal castings; and no separated parts in stone or insulation brick, unless you are an expert.

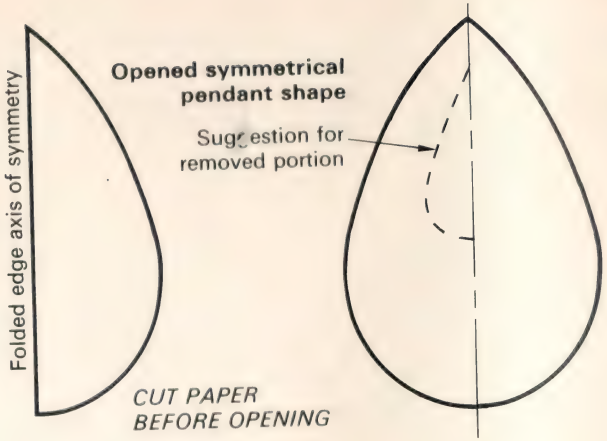
Remember that art-form sketches can only be a starting point for improved work in three dimensions.

Sketch a series of action shapes from your own ideas, which are suitable for wood sculpture, or decorative shapes in sheet copper, brass, or forged strip.

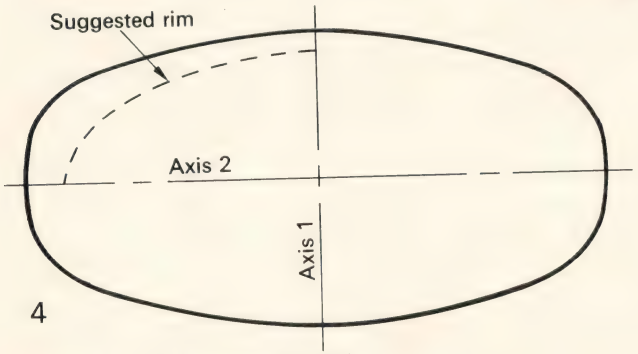


Single and double axes of symmetry

FOLDED PAPER CAN BE CUT TO PRODUCE SYMMETRICAL SHAPES

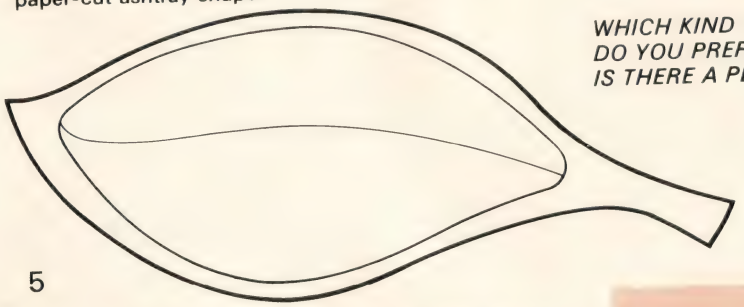


CUT PAPER BEFORE OPENING

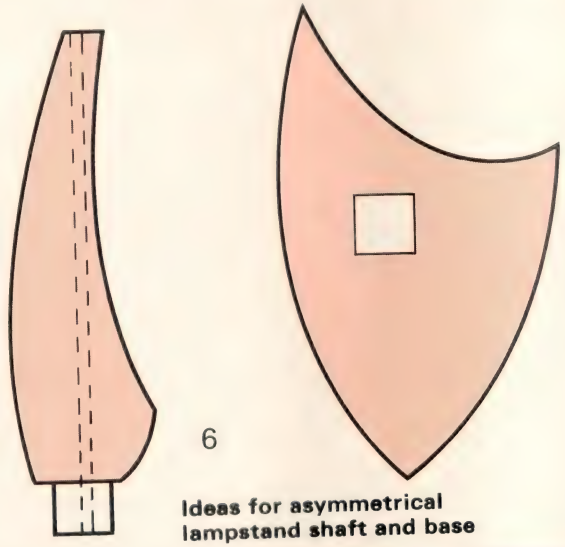


Double axes of symmetry for this paper-cut ashtray shape

WHICH KIND OF SYMMETRY DO YOU PREFER? IS THERE A PLACE FOR BOTH?



Asymmetry is shown in this leaf-shaped bowl



Ideas for asymmetrical lampstand shaft and base

SYMMETRY AND ASYMMETRY — SHEET 37

Shapes which are perfectly balanced on either side of a centre line are said to be *symmetrical*. The centre line is an *axis of symmetry*. Odd shapes, or free shapes, are *asymmetrical*.

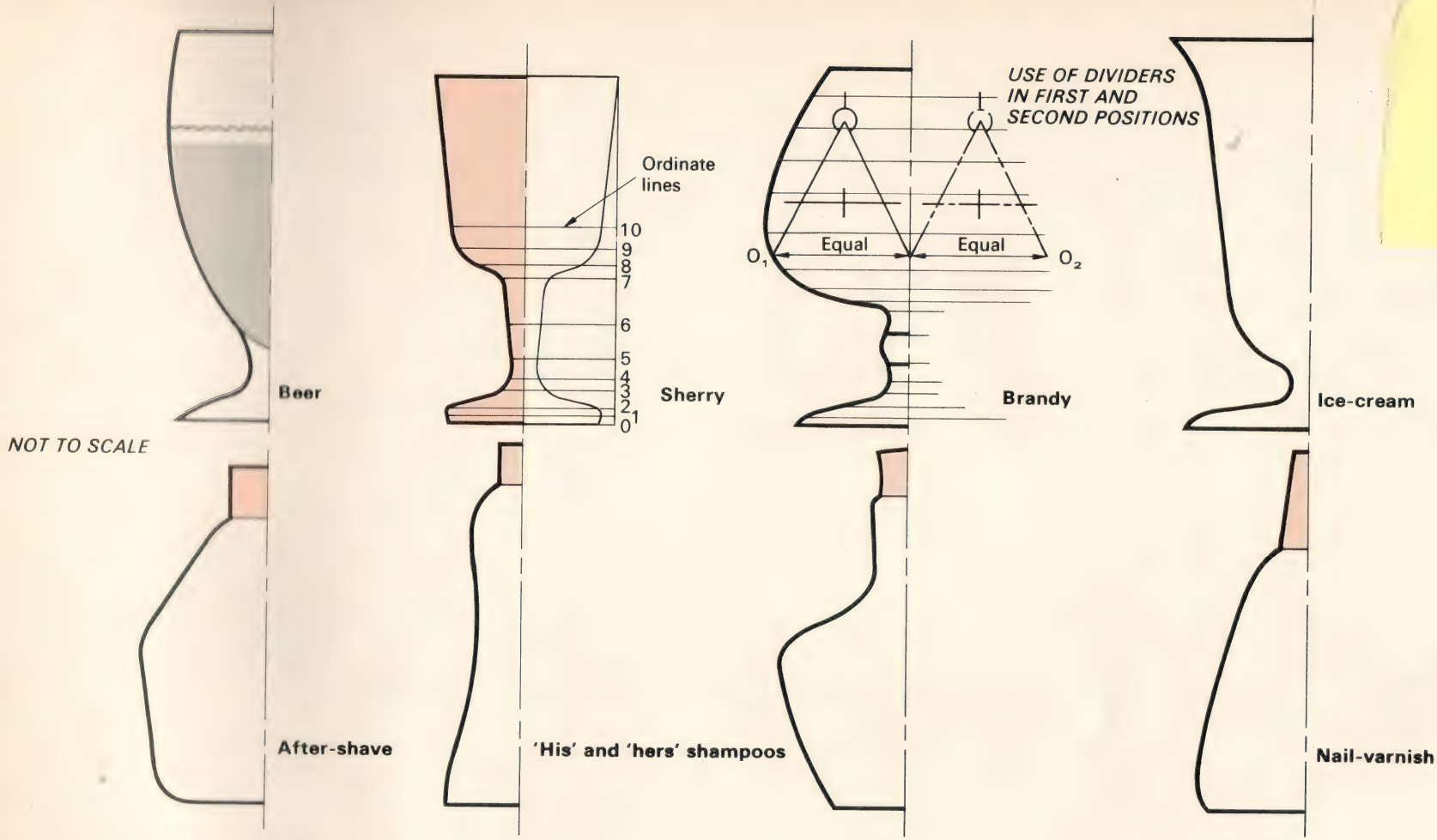
Figure 1 is a quadrilateral shape known as a *trapezium*. It has two sides parallel and one axis of symmetry. In building work on arches this shape forms a *keystone* and helps to transmit the weight of a wall through the arch span.

The diamond shape in Fig. 2 has two axes of symmetry.

Folding and cutting paper produces the symmetrical shapes in Figs. 3 and 4.

Exercises

1. Sketch a series of symmetrical and asymmetrical pendants. Consider both wood and metal for your materials. Consider the application of gem stones, abolone shell, or enamelling as decoration.
2. Design an asymmetrical fruitbowl to be made in wood. Include a plan view and possible elevations and sections.
3. Design a lampstand similar to the one shown in Fig. 6, or entirely out of your own ideas.



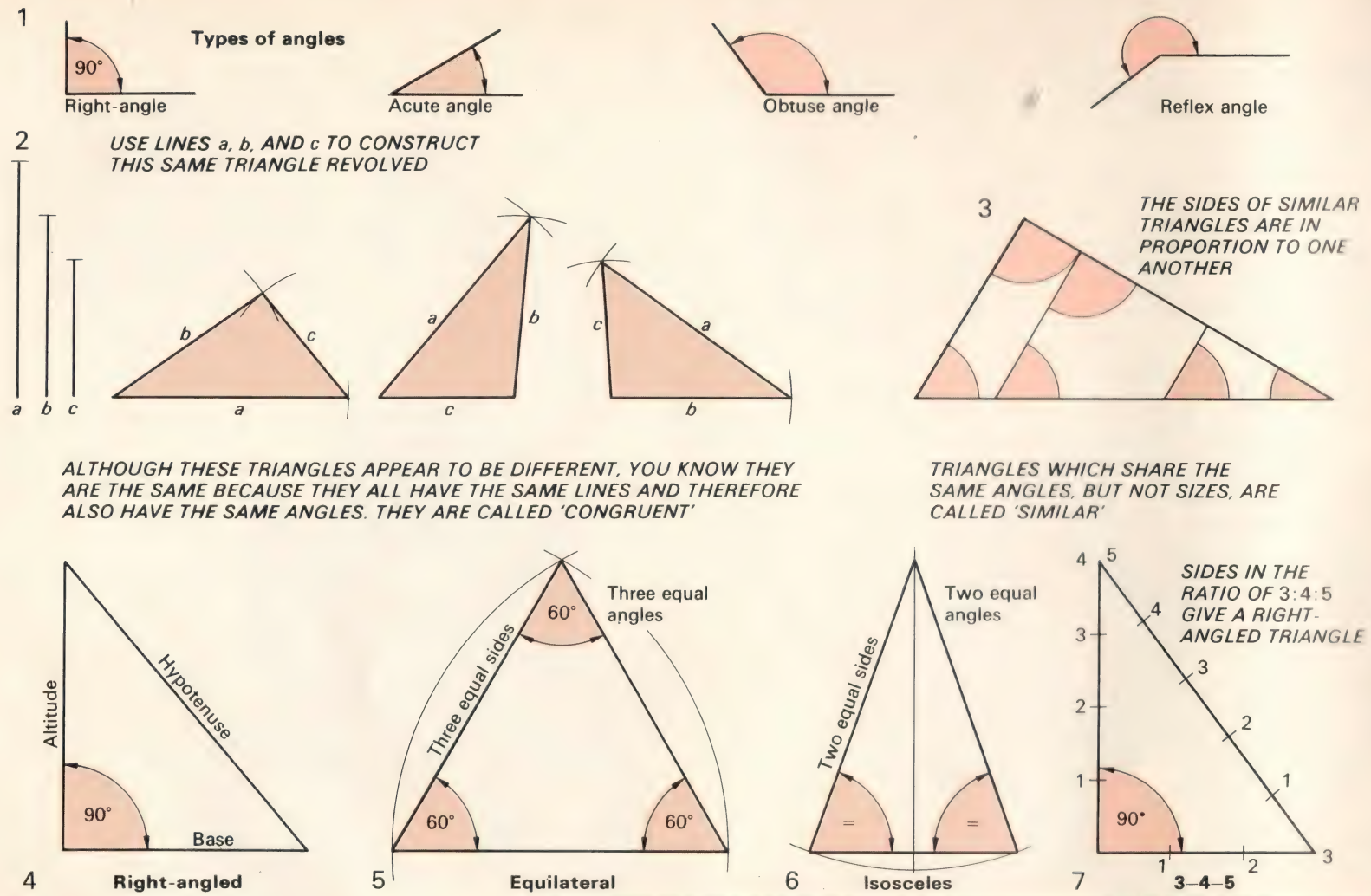
This is an exercise in the study of containers, and in obtaining symmetrical shapes by ordinates. The sherry glass has been worked out for you. Ordinates have been suggested for the brandy glass.

Method

(a) Experiment on scrap paper to obtain the basis of the shape you have in mind.
(b) From a base line and a centre line set off the maximum height and width.
(c) Sketch in the improved version of your ideas.
(d) Make further adjustments and draw in a firm outline to the left of the centre line.
(e) Take horizontal ordinates at important points, especially where the shape changes.
(f) Using dividers, transfer these distances (centre line to outline) to the opposite side.
(g) Draw a fair curve through the points obtained.

Exercises

1. Make very similar drawings to the series of glasses and bottles in the examples given.
2. Study the shapes of glasses, bottles, and other containers in your own home or shop windows. Sketch them as carefully as you can. Are there further examples in school?
   Take particular note of proportion.
   Estimate or measure the relationship of width to height.
   How long is the neck of the bottle, or finger stem of the glass in relation to the remainder?
   At what angle do the sides slope?
   How could you obtain this angle without a protractor?
3. Give an example of an actual bottle or glass which you think is of poor design or shape. Indicate why you think so.
   Make modifications and draw a restyled version, indicating your ideas for improvement.
4. Draw a series of half-sections suitable for wooden bowls turned on the lathe.



You should already be familiar with the angles shown in the series in Fig. 1.

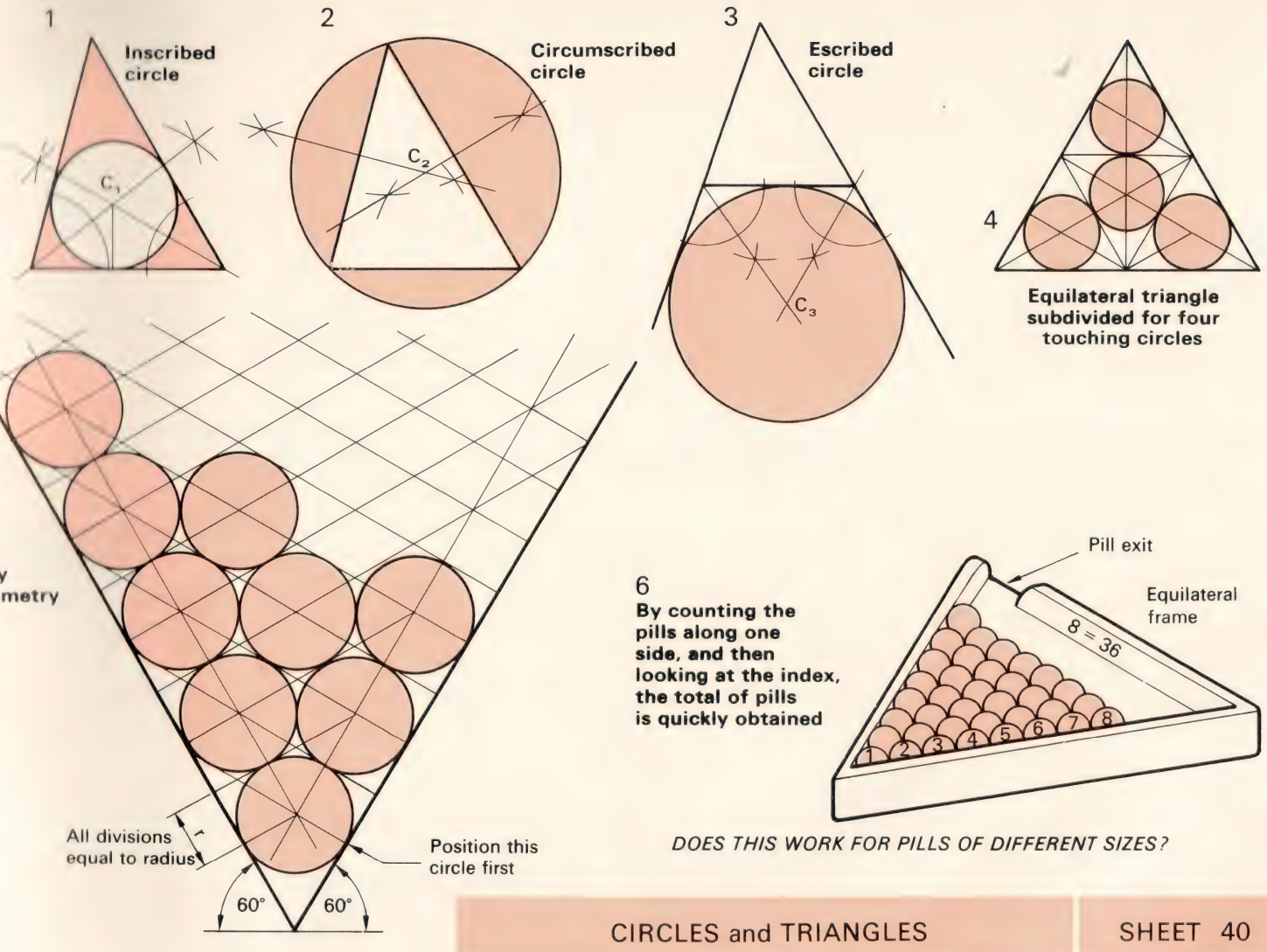
In Fig. 2, the lines *a*, *b*, and *c* have been joined together to make the triangle *abc*. Start with the base line *a*. Set your compasses to *b* and *c*, respectively, and from the ends of line *a* strike arcs to give the intersection of lines *b* and *c*.

Repeat this triangle, but revolve it on to different sides.

The triangle constructions in Figs. 3 to 7 should be self-explanatory. Where two or more sides of a triangle are equal, set your compasses to the length of side and strike off an arc of intersection. Do this for the *equilateral* and *isosceles* triangles.

Exercises

1. Copy the triangles and notes as given on the sheet.
2. Construct a triangle with sides of: 24, 25, and 7. What do you discover about it?
3. Do you think that you are now clever enough to construct a triangle with sides in the ratio of 1, 2, and 3? Have a try.
4. Try drawing the side view of an opened-out deck chair. Make a model of one in balsa wood.



DOES THIS WORK FOR PILLS OF DIFFERENT SIZES?

A first-class example of an application of basic geometry in a realistic and everyday situation can be seen in Fig. 6—the chemist's pill-counting aid. It is made out of pressure-moulded, thermosetting plastic which is hygienic and easily cleaned. If you think of the time it saves the chemist in counting out each pill for dozens of prescriptions every day, then you will realize its high productivity value.

A child could also use it to check his number of marbles.

Figures 1 to 4 give the better-known examples of circles and triangles.

Figure 5 shows the basic geometry for the pill tray. The method of obtaining the centres is shown, and with your knowledge from previous examples it should be clear. Accurate work is essential.

Exercises

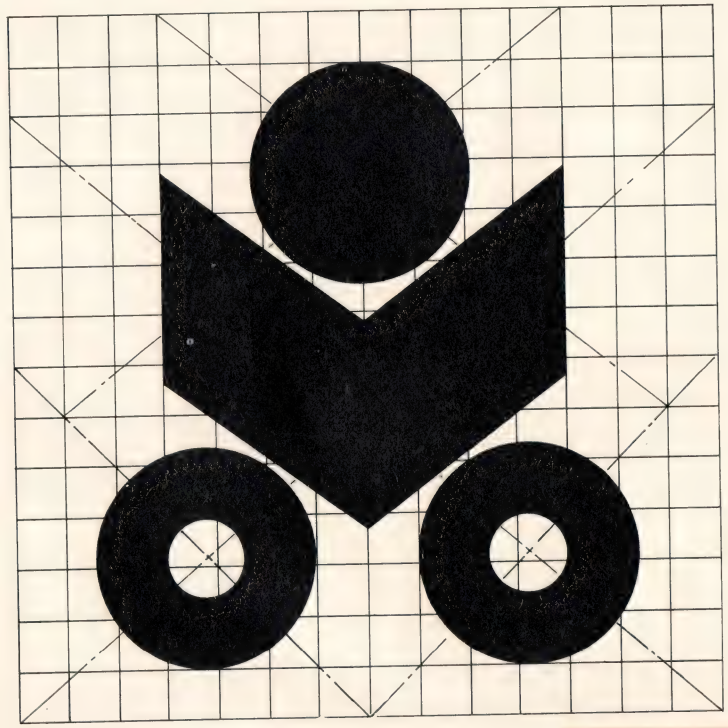
1. Make large and accurate copies of the examples in Figs. 1 to 4.
2. Draw a very large equilateral triangle to represent a pill tray. Taking the radius of the pill as 12 mm, obtain 9 complete rows of pills, and determine the total number.

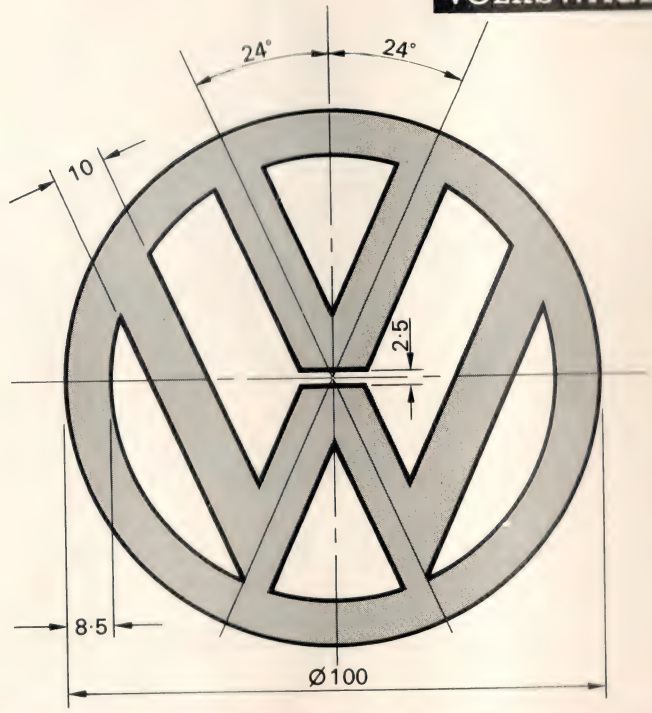
NSW DEPARTMENT OF TECHNICAL AND FURTHER EDUCATION

Examples of communication which apply triangles and circles

VOLKSWAGEN

DIMENSIONS BASED ON A PERCENTAGE OF THE DIAMETER





TRADE SYMBOLS

SHEET 41

Based on a grid of squares, 14 units square. Use the correct intersecting lines to locate the centres of the circles.

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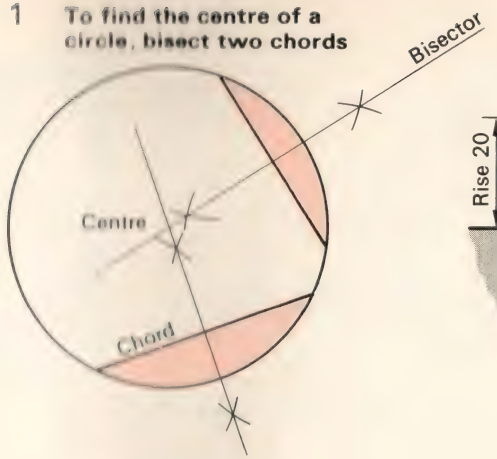
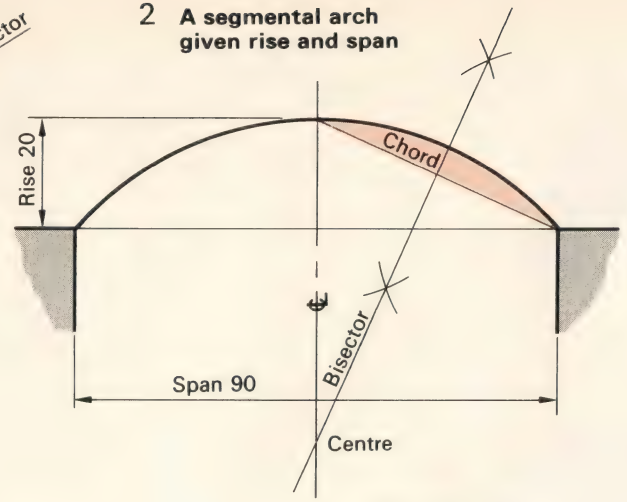
Draw these two symbols which make use of circles and triangles in their construction.

1 **To find the centre of a circle, bisect two chords**



2 **A segmental arch given rise and span**



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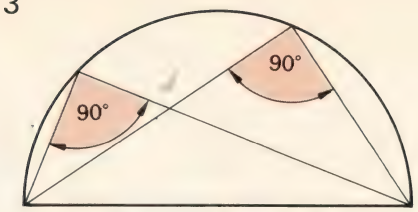
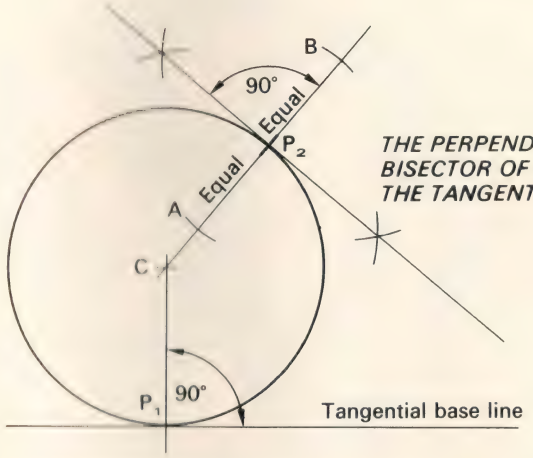


Triangles in a semi-circle are always right-angled

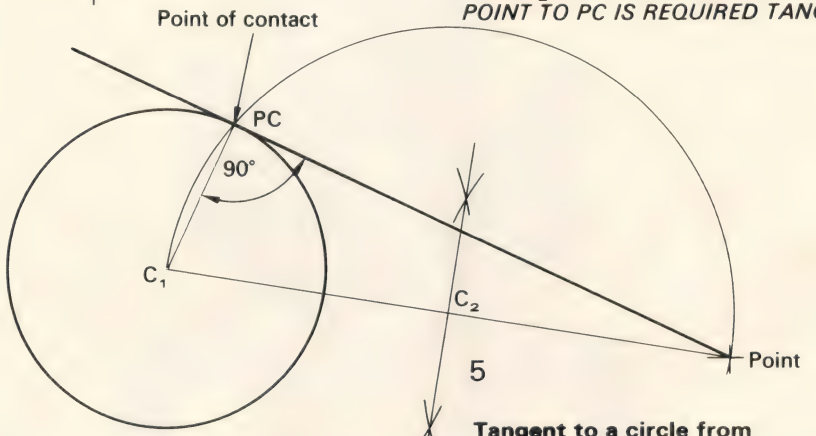
THE ANGLE IN A SEMI-CIRCLE IS ALWAYS 90°



THE PERPENDICULAR BISECTOR OF AB IS THE TANGENT TO P_2

4 **Simple tangents to points P_1 and P_2 on the circumference of a circle**

JOIN POINT TO C_1. BISECT TO GIVE C_2. STRIKE SEMI-CIRCLE. POINT TO PC IS REQUIRED TANGENT



5

Tangent to a circle from a point outside, using the angle in a semi-circle

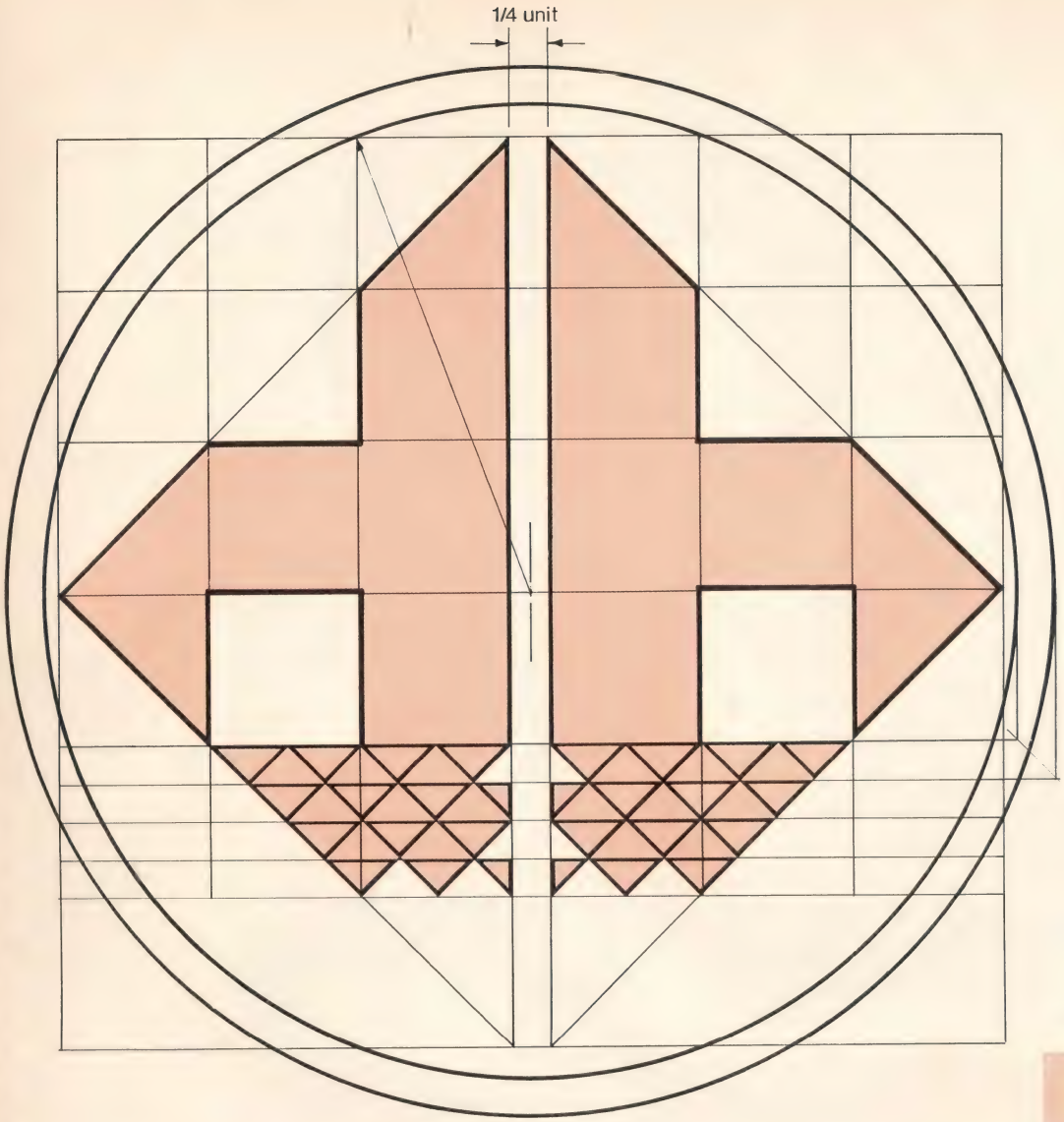
CIRCLE GEOMETRY | SHEET 42

Draw the examples in Figs. 1 to 5, including the notes.

Figure 2 is an essential construction for window and door arches, and bridges. You should be able to see how the principles in Fig. 3 have been used to solve the construction in Fig. 5.

Exercises

1. Place a circular disk on your drawing paper and draw round it. Find the centre of this circle.
2. Not too far apart, mark three points anywhere on your paper, and draw a circle to pass through them. Show your construction clearly.



DIAMOND&BOART

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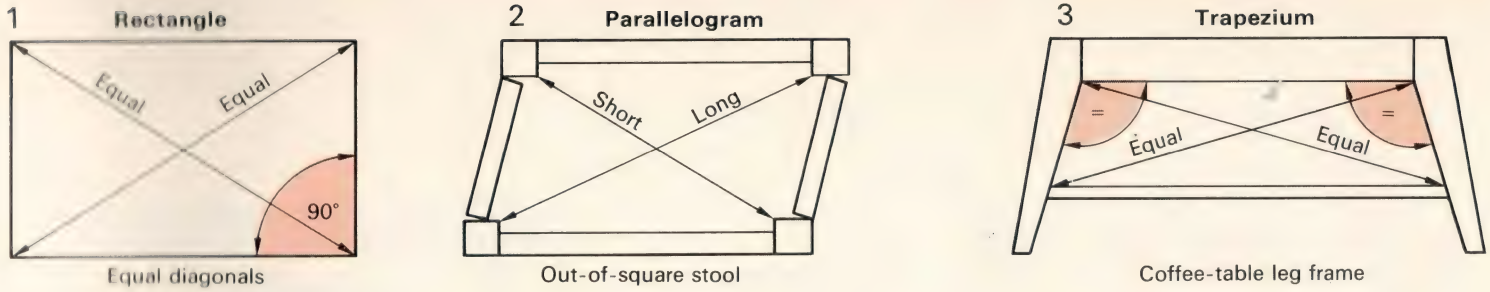
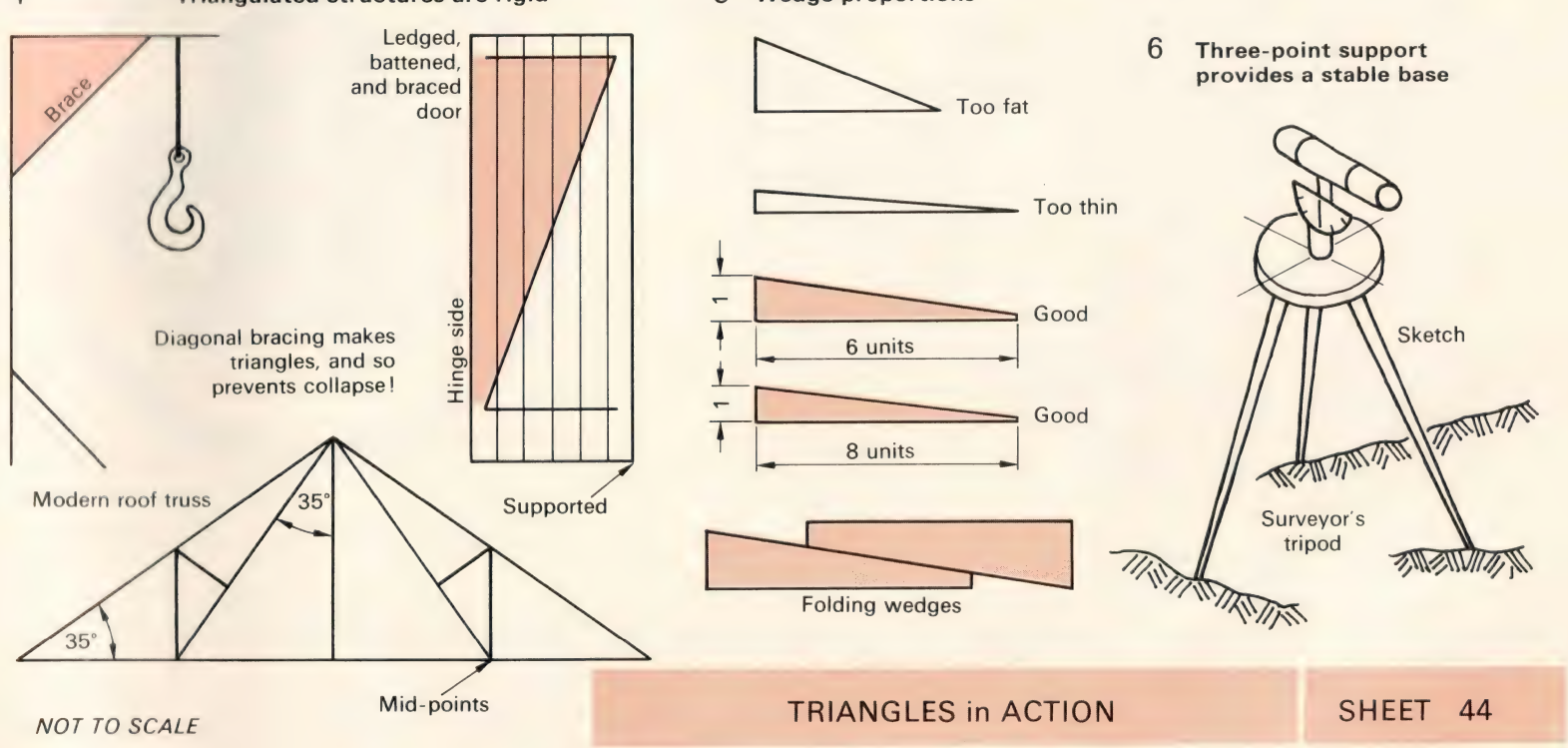
TRADE SYMBOL

SHEET 43

The Diamond and Boart symbol is a clever design which uses the two letters d, for Diamond, and b for Boart to form a pictograph of a diamond bit. The circle represents the holes formed by these cutting tools.

Diamond and Boart are manufacturers of diamond bits and cutting tools.





TRIANGLES in ACTION

SHEET 44

When the diagonals of a square or rectangle are equal then the corners are right-angles. Figures 1, 2, and 3 show this in relation to familiar school craft items.

Figure 4 emphasizes that in constructional work triangulated structures are very strong, because triangles keep their shape under load. The diagonal brace on the hook post helps to take the weight of the horizontal arm. The brace is said to be in *compression.*

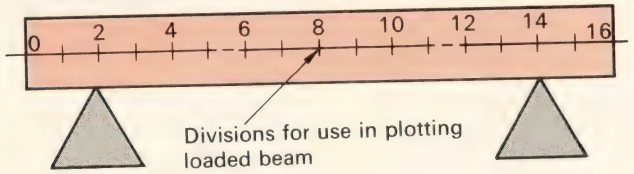
Wedge proportions are shown in Fig. 5 as another aspect of the work of triangles. Do you know why some proportions are better than others?

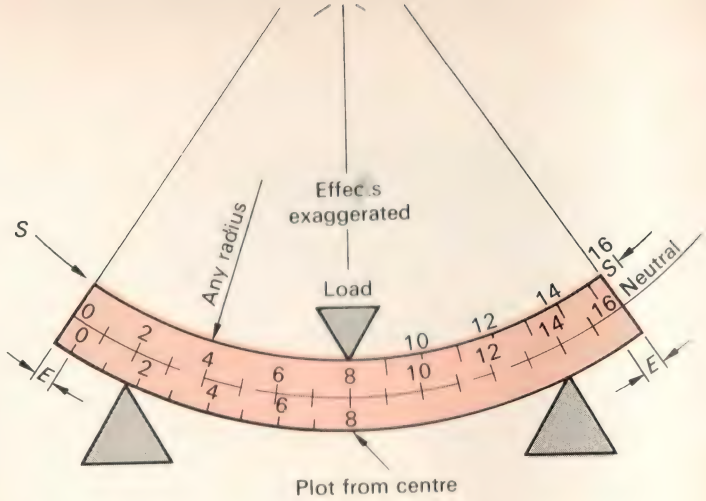
Three-point support (Fig. 6) simply means that an object stands on three legs, feet, or points. This is often required for stability. A three-legged stool will not rock on a rough ground surface, whereas a four-legged one would.

Exercises

1. Examine the tools in the school workshops and write a list of those which make use of wedges or half-wedges.
2. Make sketches of other articles which stand upon three points. Include a wheelbarrow and an aeroplane.

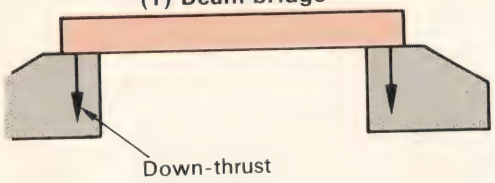
THE DIAGRAMS SHOW A BEAM AND THE EFFECT OF CENTRAL LOADING
THE TOP SURFACE IS IN COMPRESSION AND MAY BE SHORTENED (S)
THE BOTTOM SURFACE IS IN TENSION AND MAY BE EXTENDED (E)
THE CENTRAL LAYER IS NOT AFFECTED AND IS NEUTRAL



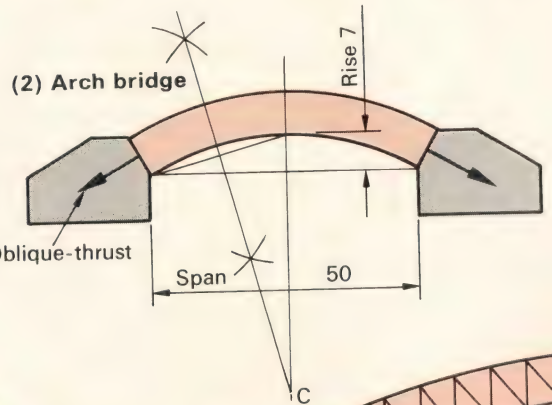


The three main types of bridges:

(1) Beam bridge

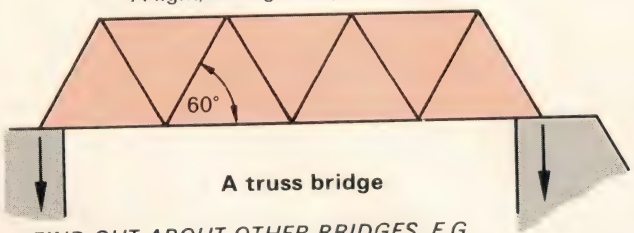


(2) Arch bridge



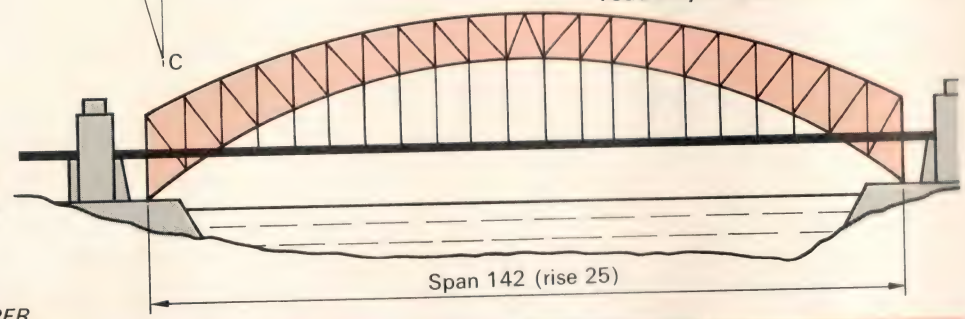
(3) Suspension bridge

A light, strong triangulated beam



A truss bridge

An arch bridge with suspended roadway or deck



FIND OUT ABOUT OTHER BRIDGES, E.G., SUSPENSION, CANTILEVER, BOWSTRING, SWING, TRANSPORTER, LIFTING, POST, BASCULE, AND CLAPPER

NOT TO SCALE SUPPLY DETAILS NOT GIVEN

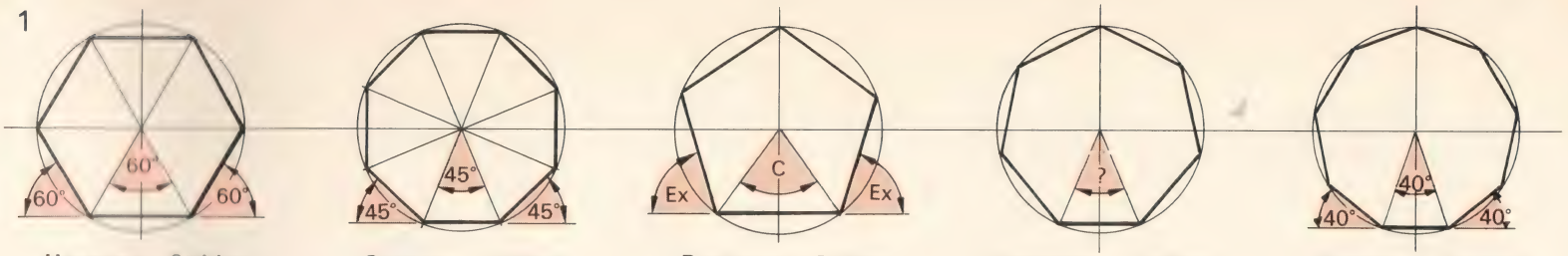
BRIDGES SHEET 45

The diagrams explain the terms 'tension' and 'compression', and show the three main types of bridges.

Exercises

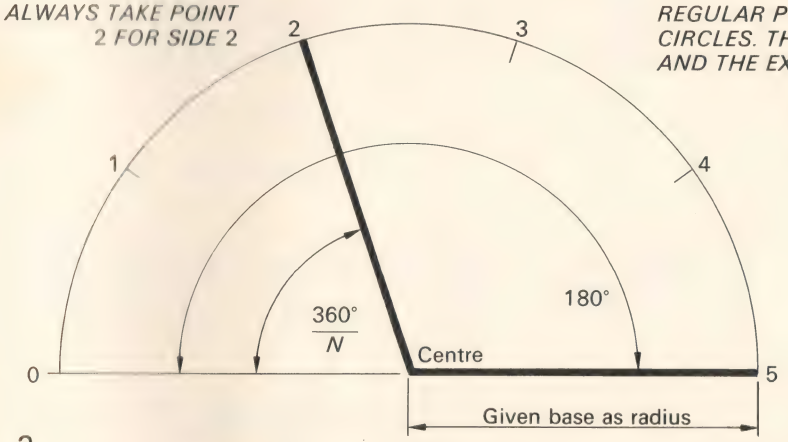
1. Study and draw the diagrams and bridges.
2. Find out about other types of bridges and make a study of *one* of them. Prepare a chart of diagrams and other illustrations of your choice of bridge. Construct a balsa or stripwood model of one.
3. Write biographical notes on the life of Thomas Telford or Isambard Kingdom Brunel.
4. Make a triangulated structure in stripwood to bridge a known gap, to carry a known weight, and which is to be as light as possible. Alternatively, make a similar structure to carry as large a weight as possible.

1



Hexagon 6 sides **Octagon 8 sides** **Pentagon 5 sides** **Heptagon 7 sides** **Nonagon 9 sides**

ALWAYS TAKE POINT 2 FOR SIDE 2



2

Regular polygon construction given base *N* for this example = 5

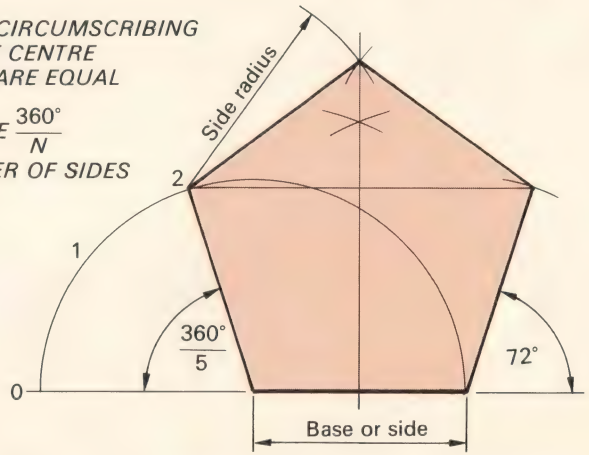
Divide the semi-circle into *N* divisions = $\frac{180^\circ}{N}$

Join centre to point 2 for second side

REGULAR POLYGONS HAVE CIRCUMSCRIBING CIRCLES. THE ANGLE AT THE CENTRE AND THE EXTERNAL ANGLE ARE EQUAL

THE ANGLES ARE $\frac{360^\circ}{N}$

N IS THE NUMBER OF SIDES



3 **Construction of a regular pentagon**

4 **Does the construction in Fig. 2 also work for a square and triangle?**

THE CHRYSLER 'PENTASTAR' IS BASED ON A PENTAGON. CAN YOU FIND OTHER EXAMPLES OF POLYGONS IN ACTION? EXAMPLES: NUTS and BOLTS, PETROL CAPS, TABLE LEGS, and JEWELLERY

REGULAR POLYGONS SHEET 46

Polygons are figures with many straight sides. The series of five drawings in Fig. 1 shows a range of *regular polygons* with from five to nine sides. They have been drawn in this manner to emphasize their common geometry, and for easy comparison. You will observe that a regular polygon has:

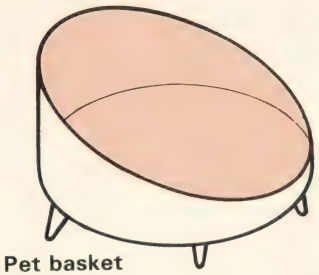
(a) all sides the same length; (b) all angles equal; (c) a circumscribing circle.

Irregular polygons do not obey these rules.

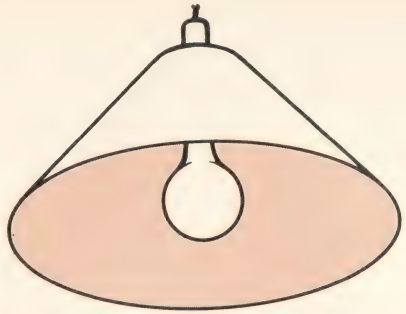
The degrees on the drawings show the external and centre angles. The rule for calculating these angles is shown. This relates to the fact that a regular polygon fits into a circle. There are 360° in a circle; and they are shared equally by the internal triangles subtended by the number of sides.

Exercises

1. Draw the series of polygons in Fig. 1. Why are the angles for the heptagon only approximate?
2. Draw the pentagon in Fig. 3 on a side of 40 mm.
3. Find out about Fig. 4, and think about the question. Give the reasons for your answer.
4. Make a sheet of sketches showing examples of polygons in action. Start with a section of a pencil and a honeycomb cell.
5. Find out why you should take point 2 for side 2 in the construction method in Fig. 2. You should be able to prove this by simple division.



Pet basket



Lampshade

Trade symbol

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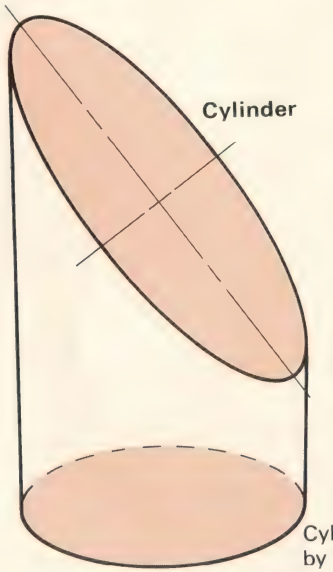
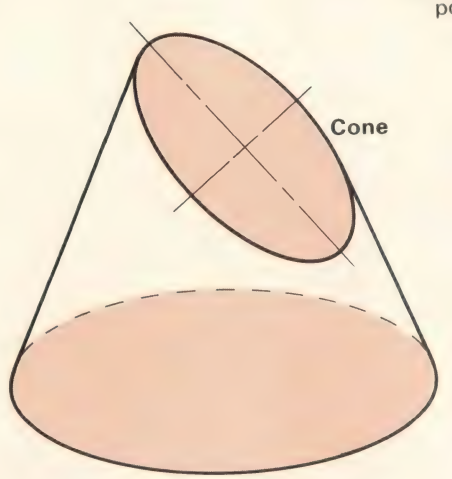
Can for oil

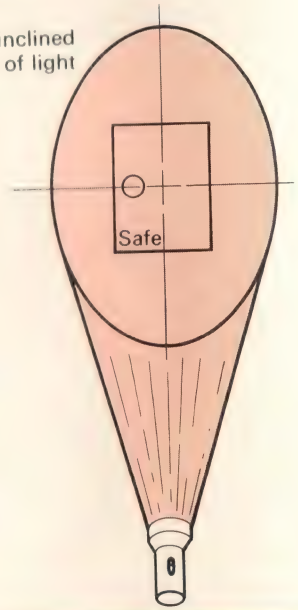


Cylinder



Cone

Cylinder and cone cut by inclined planes



THE ELLIPSE (1)

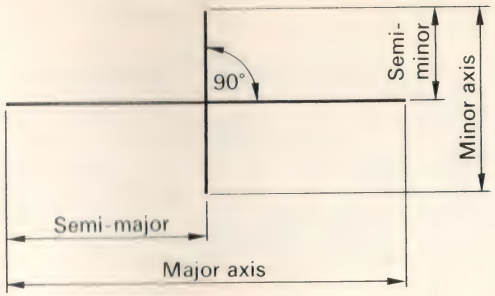
SHEET 47

The series of sketches shows some examples of the *ellipse* in everyday life.
You should be able to identify an ellipse as:

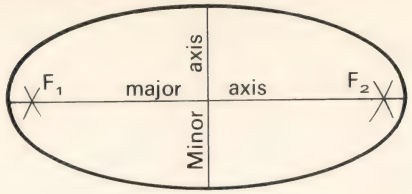
(a) an oblique section of a cylinder;
(b) an oblique section of a cone;
(c) an inclined circle.

Experiment with shining torchlight squarely upon a wall—you should see a circle. Tilt the torch upwards slightly and you will see an ellipse. Tilt it even more and you will enter the mysterious realms of parabolas and hyperbolas.
Sketch the examples.

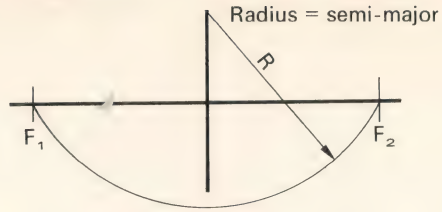
1 **The ellipse axes**



2 **The complete ellipse**

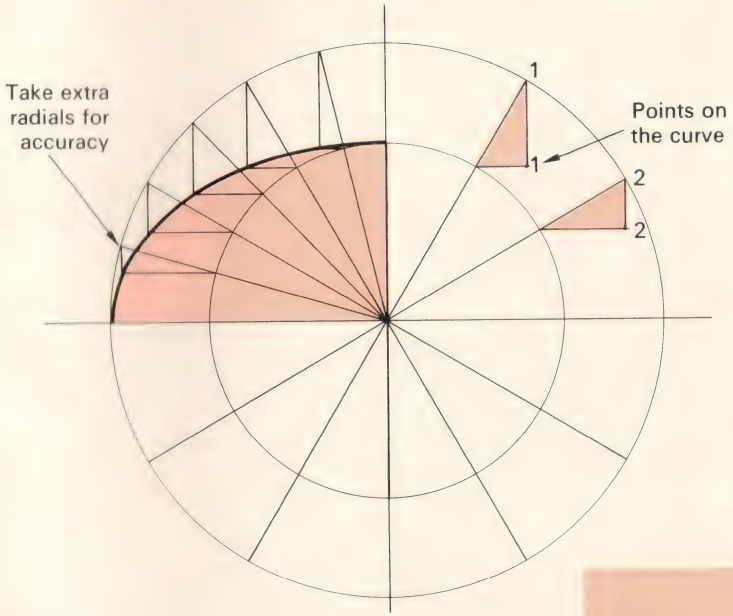


3 **Focal points**

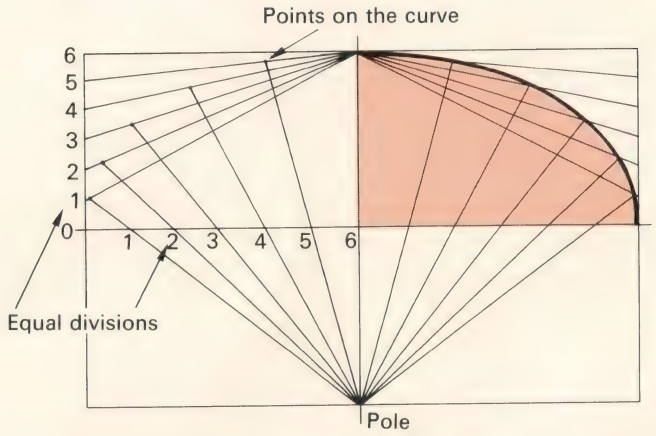


F_1 and F_2 are the *focal points*

4 **Construction in two circles**



5 **Construction in a rectangle**



THE ELLIPSE (2) SHEET 48

An ellipse has two axes of symmetry, as shown in Fig. 1. The *major* axis must be longer than the *minor* axis, and the axes must bisect each other at right-angles.

When the semi-major axis is struck by compasses from one end of the minor axis, as in Fig. 3, the arc produces two very important points called the *focal* points. These are shown in relationship to the elliptical curve in Fig. 2.

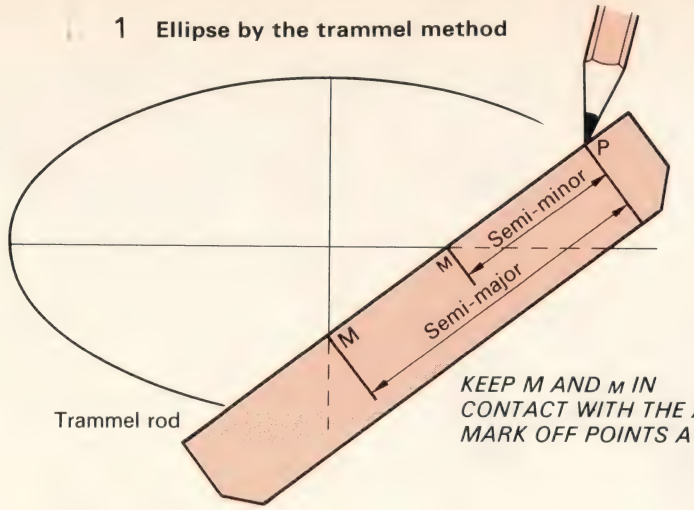
Figure 4 shows the concentric or auxiliary circles method of construction. It occupies more space than method 5, but allows radials to be taken anywhere. Take extra radials near the fall of the curve as it approaches the major axis.

The method shown in Fig. 5 requires some painstaking division. The construction is very useful when an ellipse is needed in a rectangle of material which does not have a surrounding border.

Exercises

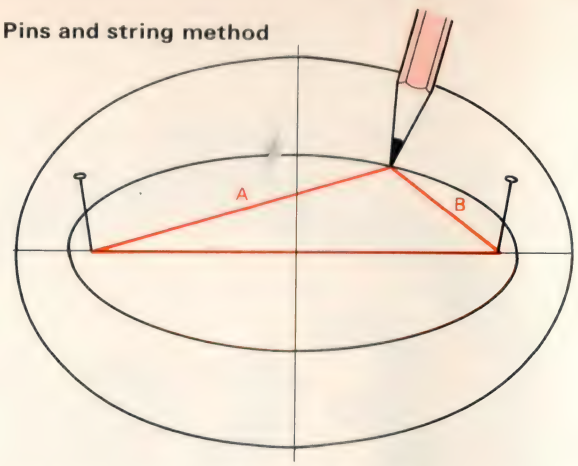
1. Copy Figs. 1 and 3, and draw the complete ellipses in Figs. 4 and 5.
2. Using the method in Fig. 4, draw an ellipse; but this time revolve the axes clockwise, so that the major axis is inclined at 30° to the horizontal.

1 Ellipse by the trammel method



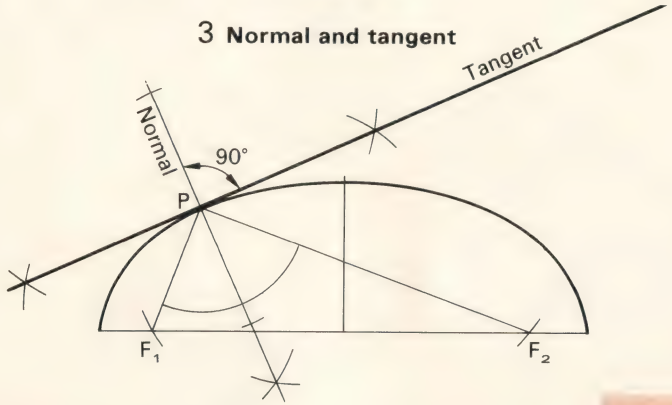
KEEP M AND M IN CONTACT WITH THE AXES. MARK OFF POINTS AT P

2 Pins and string method



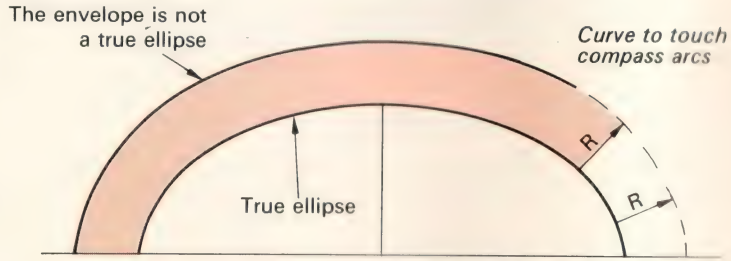
THE PINS ARE AT THE FOCAL POINTS. IN ALL POSITIONS THE LENGTHS A and B ADD UP TO THE MAJOR AXIS

3 Normal and tangent



NORMAL LINES ARE REQUIRED FOR JOINT LINES IN ELLIPTICAL ARCHES

4 Envelope curve



AN ATTRACTIVE CONSTRUCTION FOR ARCHES

THE ELLIPSE (3)

SHEET 49

The *trammel method* is very useful in the workshop, because no drawing instruments are needed beyond a trammel rod. The method should be clear from the drawing in Fig. 1

Figure 2 shows a convenient, but none too accurate, method of ellipse construction. It could be used when marking out an elliptical flower bed.

A tangent to an ellipse is obtained by the method shown in Fig. 3:

(a) join P to focal points;
(b) bisect angle to give a normal line;
(c) construct a perpendicular to the normal at P.

Where a curve parallel to a given ellipse is required, it is obtained by striking and joining arcs as shown in Fig. 4. When you have experimented with the pins and string method of construction, you will realize that you cannot in the normal way obtain a true ellipse which is parallel to another one.

Exercises

1. Draw the given examples. For Fig. 2, start by experimenting with drawing different ellipses by keeping the same focal points, but altering the string length. Finally, keep the same string length but alter the focal points equally along the major axis.

2. Two or more ellipses can have their axes in the same ratio. For example, if the axes were 70 and 100 the ratio obviously would be 7:10. Another ellipse with axes in this ratio might be 49:70, where 49 is seven-tenths of 70.

Construct two ellipses in the same ratio, the smaller inside the larger, and sharing the same major axis. Place the small ellipse so that the end of its major axis passes through the right-hand focal point of the large ellipse.

Take the axes as:

large ellipse major 100, minor 60;
small ellipse major 60, minor ?

3. Use the double ellipses produced by the above exercise as the basis of a design for a trade symbol. State the industrial or commercial ideas or elements for which the symbol might be appropriate. Add lines and printing to the ellipses, if you think that such additions would improve the symbolic representation.

THE RIM OF THE SIGN IS BASED ON TWO TRUE ELLIPSES WHICH APPEAR TO BE PARALLEL

ELLIPSE AXES FOR THIS EXAMPLE

LARGE ELLIPSE MAJOR, 132; MINOR, 91
SMALL ELLIPSE MAJOR, 114; MINOR, 75
GRID SIZE FOR THIS EXAMPLE 5 mm sq.

DRAW THE ELLIPSES USING THE AXES DIMENSIONS SUPPLIED.
PLOT THE 'ESSO' USING THE GRID.
THE MINOR AXIS PASSES BETWEEN THE LETTERS 'S'.
THE CENTRE BAR OF THE 'E' RESTS ON THE MAJOR AXIS

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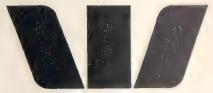
TRADE SYMBOL

This elliptical symbol is shown with a grid for the purposes of plotting the letters.
Draw the ellipses using the axes lengths supplied.
Note that both the curves are *true* ellipses, which only appear to be parallel. No 'envelope curve' as on Sheet 49 is involved.

Guest Keen & Nettlefolds

Bankcard

Eagle Pencil Company



Bank of New South Wales

McPhersons Ltd

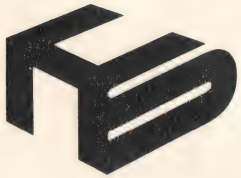
B.P. Ltd

McCULLOCH
OF AUSTRALIA
McCulloch of Australia

Chubb

The 'Flying D'

Dunlop Ltd



Hawker Siddeley Group

ACKNOWLEDGEMENTS ARE GRATEFULLY GIVEN TO THE CONTRIBUTORS BY WHOSE PERMISSION THESE LOGOS AND HOUSE SYMBOLS ARE REPRODUCED

LOGOGRAMS

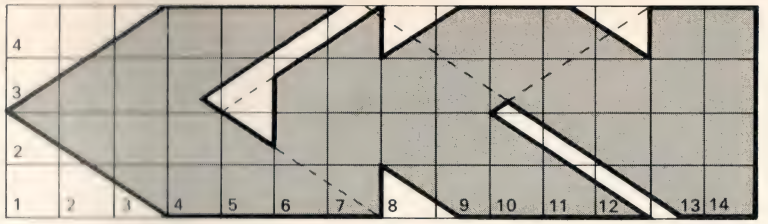
SHEET 51

Many enterprises have trademarks or symbols by which they can be readily identified. Examples can be seen in all areas of business, from the simple letterhead to the national symbols. They have become very popular as a means of visual communication. When the symbol is made up of initials it is called a *logogram*, or as some refer to it a 'logo'.

The examples on the sheet have been chosen to show some of the work of professional designers. Ideas about corporations and products are communicated to you by means of simple but well-thought-out symbolic pattern.

Exercises

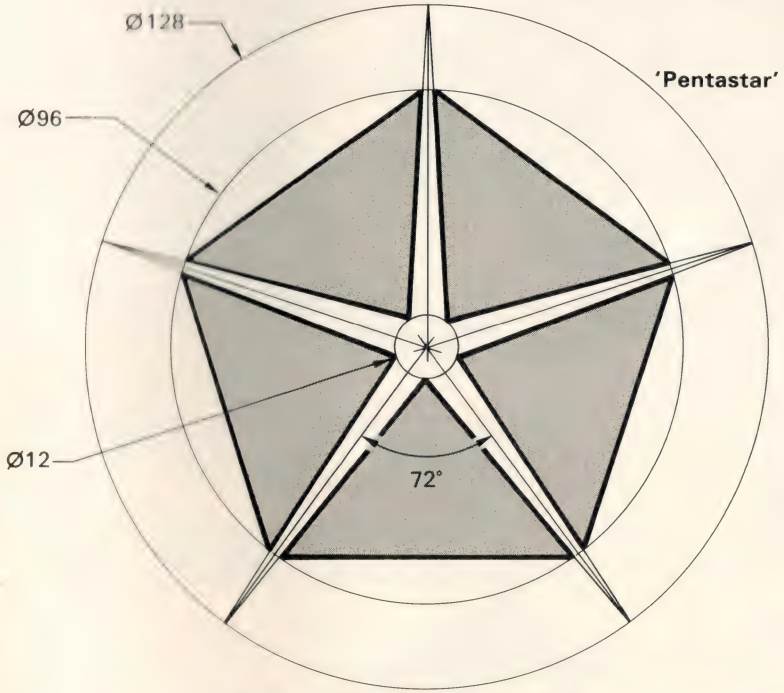
1. Study the examples by making sketches of them and by trying to discover their geometrical structure. Do you think that some of them have a hidden meaning? Write a sentence about one of them describing how it is composed, and the ideas behind it.
2. Make development sketches and final, coloured drawings of a logogram for *one* of the following:
your own initials; a football team; a well-known wrestler; a youth club.
3. Make a collection and scrapbook of logo and symbols. Write a sentence to describe the ideas which you think compose them.



REPRODUCED, WITH GRATEFUL ACKNOWLEDGEMENTS,
BY PERMISSION OF
BOWATER-SCOTT AUSTRALIA LTD
CHRYSLER AUSTRALIA LTD
GUEST KEEN & NETTLEFOLDS

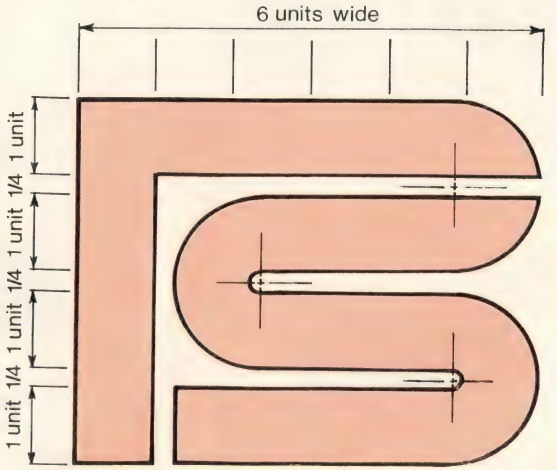
Guest Keen & Nettlefolds Ltd

DRAW THESE LOGO AND SYMBOLS TO THE PROPORTIONS GIVEN



CHRYSLER
AUSTRALIA LIMITED

BOWATER-SCOTT AUSTRALIA LIMITED



TRADE SYMBOLS | SHEET 52

Guest Keen & Nettlefolds Ltd

Here is a quotation from the GKN corporate identity manual. The Group Chairman writes:
The symbol which Mr Abram Games has designed for us reflects our engineering skill, is structurally simple and economic in form. It makes a powerful impact and by integrating the letters GKN into a single dynamic unit, expresses our purpose and identity. Above all it is a working emblem which can be applied to almost everything we do.

Bowater-Scott Australia Ltd.

In this symbol, do you see: "B", for Bowater; and "S", for Scott?

Chrysler Australia Ltd.

In addition to its use in Detroit, USA, and UK, the "Pentastar" is being used overseas in conjunction with Chrysler's Simca and Rootes affiliates. It helps to surmount language barriers.

SYMBOLIC PICTURES IN THE SAND TELL A STORY OF THE WILD WEST

STORY COMMUNICATION SHEET 53

For work of this kind you have to imagine that you cannot communicate by spoken language.

Your sketches should be bold and free from unwanted detail. Imagine that you are, perhaps, drawing in the sand with a stick.

Use a felt-tipped pen to give yourself confidence in sketching a quick line and to prevent rubbing out—or better still—actually draw in the aforementioned sand.

Exercises

1. Study the sequence of drawings and sketch the same story in your own way. Do not copy the given sketches closely; but you may take ideas from them, if you wish. How has the passage of time been indicated?
2. Write out the story in *words* by making stage-by-stage notes. Add a title for the story.
3. Scheme out a picture story of your own. Exchange this with your classmates, and see if you can discover their particular story.
4. Obtain a simply shaped object and describe the shape of it, stage by stage, to a classmate who is standing at the blackboard trying to make a drawing from your verbal analysis only.

Is this form of communication easy?

Are the results good?

1

2

3

4

KNOW YOUR MOTOR TRAFFIC HANDBOOK FOR FULL UNDERSTANDING

DO YOU THINK YOU COULD MAKE ANY IMPROVEMENTS?

REPRODUCED FROM THE MOTOR TRAFFIC HANDBOOK BY PERMISSION OF THE DEPT. OF MOTOR TRANSPORT.

HIGHWAY COMMUNICATION — SHEET 54

Road signs are warning signs which display a word or diagram describing as directly and simply as possible the particular nature of the danger. It would be difficult indeed to misunderstand signs such as those in the top series in Fig. 1. There may be scope for improvement on some others. Do you think so?

If you cannot understand the message which the sign is trying to convey, without reference to the *Motor Traffic Handbook*, is it communicating to you fully?

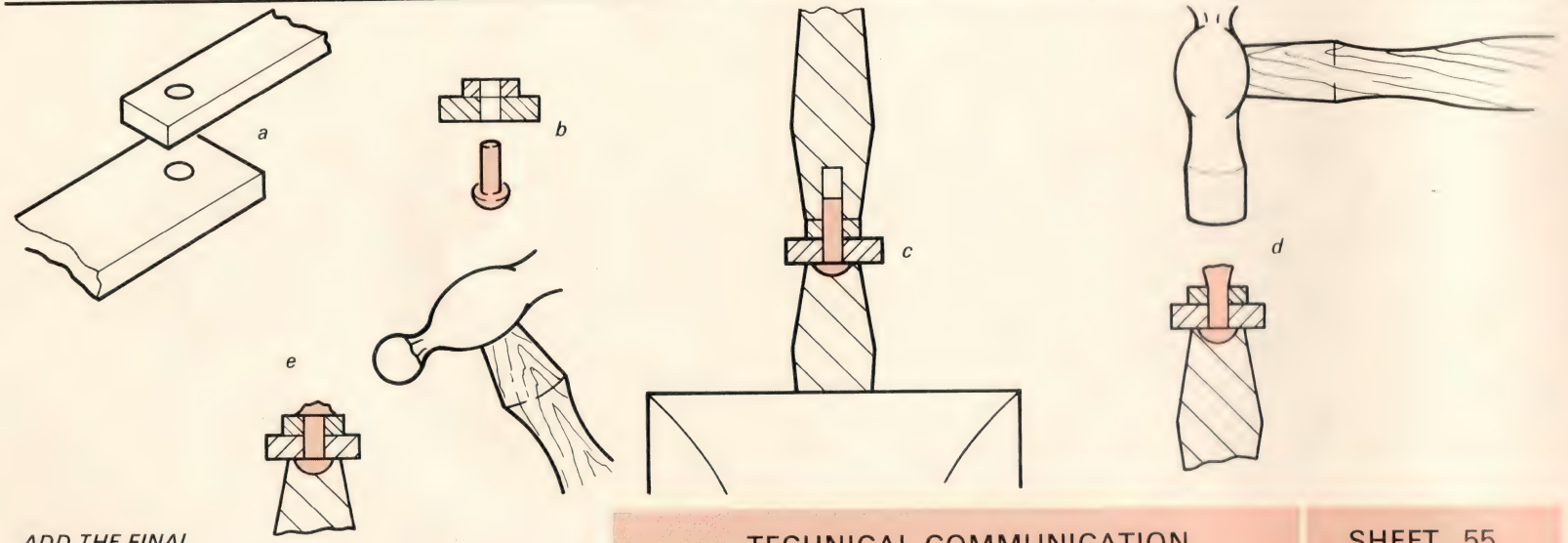
Of course, you are supposed to know the *Handbook*, because the written descriptions can explain much more than the diagrams. When you have learned the meaning from the *Handbook*, the symbol should be sufficient to remind you of it.

The other illustrations shown on the sheet give directions to the motorist or pedestrian.

Exercises

1. Would the sign "Ford" have any meaning for you, if you did not know what a ford was, or could not read English?
   Considering this and the other signs in the series (Fig. 2), make a series of development sketches, and, finally, a large drawing for each sign showing your ideas for improvement.
2. Make development sketches and final drawings to show Figs 3 and 4 diagrammatically.
3. Design a traffic sign, perhaps taking the "Forton Services" sign as an example, showing a direction to the accommodation of a motorway motel.

ARE WORDS REALLY NECESSARY TO UNDERSTAND THESE TECHNICAL PROCESSES?



ADD THE FINAL SKETCH f

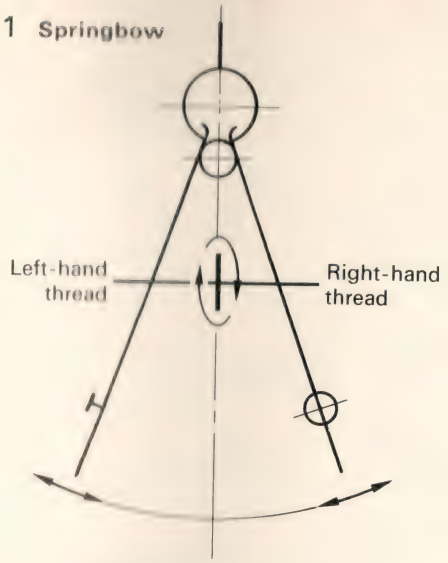
TECHNICAL COMMUNICATION SHEET 55

Each of the illustrations tells a story without words, though numbers or letters are allowed where necessary. Do the sketches convey without doubt what exactly is happening?

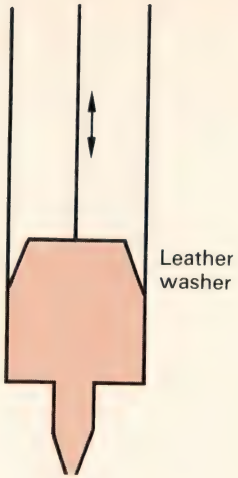
Exercises

1. Consider the series of sketches in the top row. You have probably followed a similar sequence in the woodwork room.
   Actually, the series as illustrated is incomplete, but even if you have had no experience of mixing glue you should still be able to follow the sequence, because your intelligence will enable you to assume correctly the relationships between the stages *a* to *e*.
   Study the sequence and try to discover the stages which you assume to be carried out, though they are not illustrated. For example: a sketch before *a* could show the lid of the tin being removed.
   Now that you have made a study of the given sequence, write a fully detailed series of stage-by-stage notes which might be the basis of instructions to be given to a computer. Remember that the computer cannot assume any stage you miss out. This could become quite complicated, and you may have to simplify your answer.
2. Study and sketch the riveting series. Write a series of explanatory notes.
3. Illustrate a technical sequence of your own choice from craftwork, hobby, or sporting activities.
4. Use cut-out photographs and drawings from magazines and trade literature to compile a chart illustrating any sequence of events or aspects of functional design.
   Make full use of colour and transfer lettering.
5. Making full use of all aids to communication, design an advertisement. Choose your own subject. Three-dimensional models are allowable. Get together with a friend on this project.

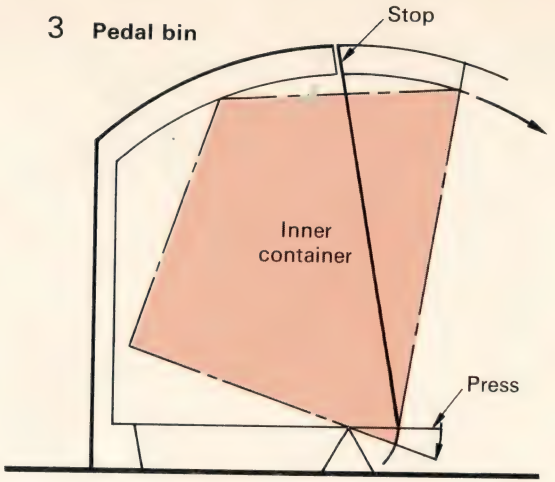
1 **Springbow**



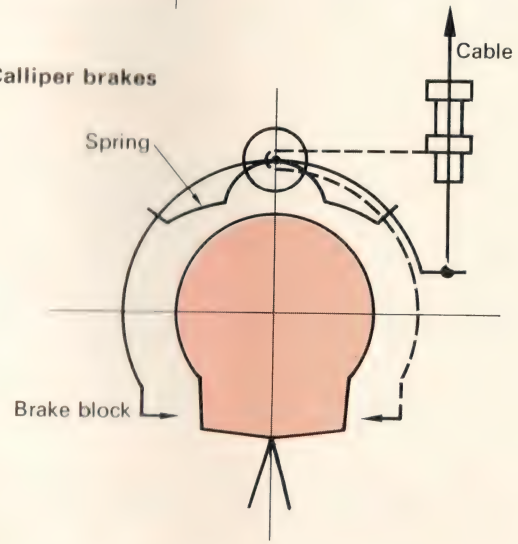
2 **Airpump**



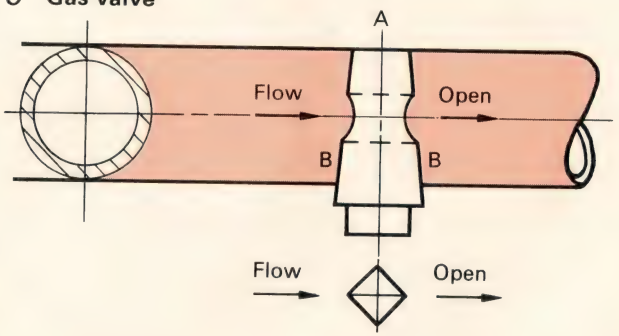
3 **Pedal bin**



4 **Calliper brakes**



5 **Gas valve**



DIAGRAMS SHEET 56

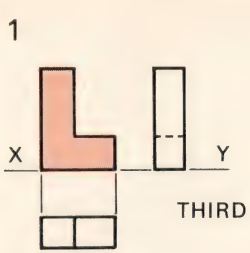
It is often convenient when illustrating a principle or designing a mechanism to do so, firstly, in the simplest possible way. Line diagrams provide such simple and uncluttered drawings. They are a stage beyond freehand sketches in the planning sequence, because they are more accurate in respect to fabrication, arrangement, and geometry.

Diagrams can also help us to understand existing mechanisms or processes. An article should be obtained—e.g., an old sparking plug—its parts analysed, reduced to their simplest terms, and then drawn diagrammatically with explanatory notes. Arrows can serve to illustrate directions of movement or applied force.

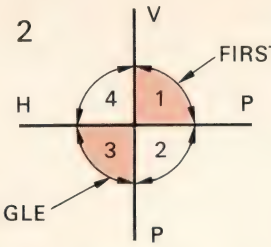
Exercises

1. Reproduce the diagrams in Figs. 1 to 5.
2. The diagram at Fig. 5 is not complete at places A and B. You are asked to suggest what is missing and to add these parts to your drawing.
3. Obtain one or two of the following items, analyse and draw them diagrammatically:

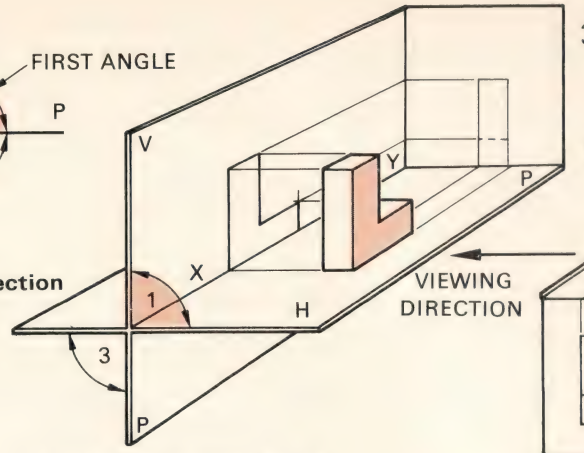
   electric torch; cigarette lighter; pocket-size pencil sharpener; empty ball-point pen; water pistol; spring clothes peg; foot-operated door bolt; marble-type towel holder; whistle; football-supporter's rattle.



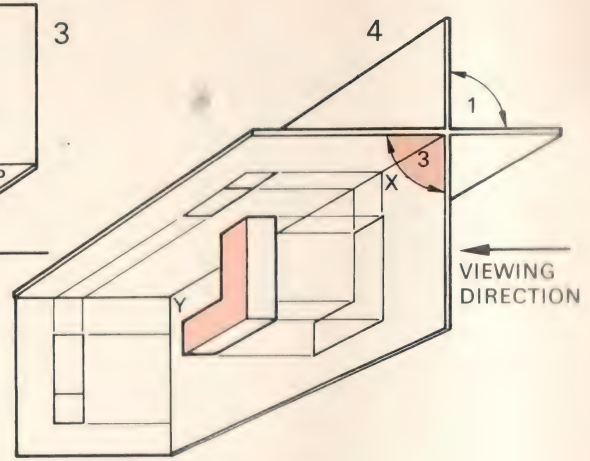
The object drawn in first-angle orthographic projection



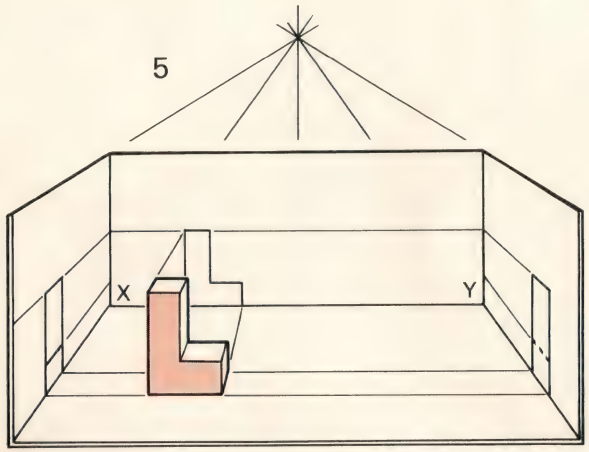
Planes of Projection



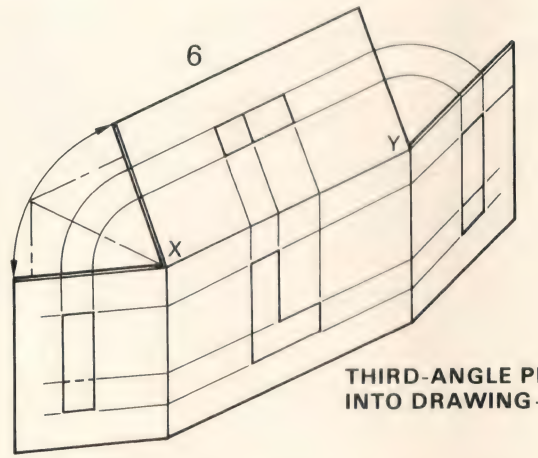
The object in the first angle



The object in the third angle



Another view of the object in the first angle



THIRD-ANGLE PLANES OPENED INTO DRAWING-SHEET FORM

FIRST AND THIRD ANGLE (1) — SHEET 57

In earlier sheets, the work in *orthographic projection* was presented without reference to systems of projection. The drawings were restricted to the *first-angle* system to avoid confusion at that early stage. It is now necessary to understand the systems of projection more deeply.

If an object, such as the one shown in Fig. 1, were to exist in the depths of space, without reference to gravity or other solar systems, it would not be known whether the object were upside-down or tilted up in any way. It would not really matter, because such terms as 'upside-down', 'sloping', or 'tilted' can only have real meaning when they are associated with known planes of reference.

In order to draw an object properly, therefore, it is necessary to supply it with a background or foreground of such known planes against which it can be projected. It is usual to add vertical and horizontal planes (VP and HP), which intersect as shown in Fig. 2. From this figure the origins of the terms *first* and *third angle* can also be understood.

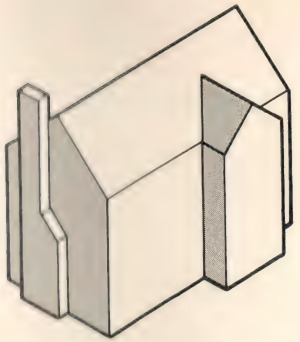
Figure 3 shows the object placed squarely in the first angle. The vertical and horizontal planes can be seen clearly in the background of the object. Note also the end-vertical plane for the end elevation. Projection lines from the object move away from the observer.

Figure 4 shows the object in the third angle between the planes. Note that the viewing direction is still the same as for the first angle. Therefore, it can be said that the planes are in the foreground of the object. Projection lines from the object move towards the observer.

Figure 5 shows another view of the object in the first angle. Two end-vertical planes enable end elevations to be recorded by projecting in either direction.

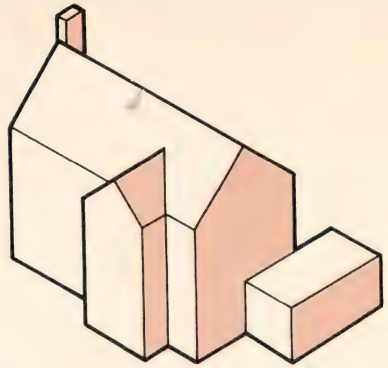
Figure 6 represents the third-angle planes being opened out into flat, drawing-sheet form. Note how the plan revolves to the top.

1



PICTORIAL VIEWS OF THE SAME HOUSE

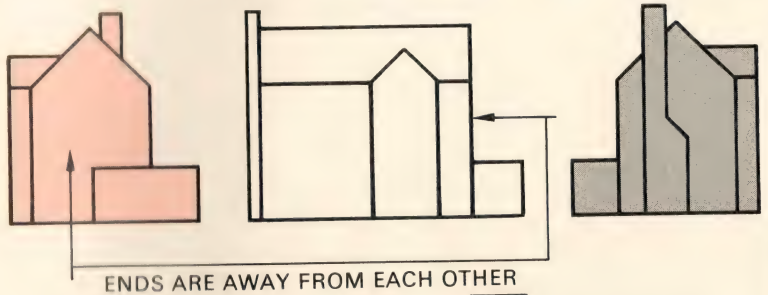
THE HOUSE IS DRAWN BELOW IN TWO SYSTEMS OF ORTHOGRAPHIC PROJECTION



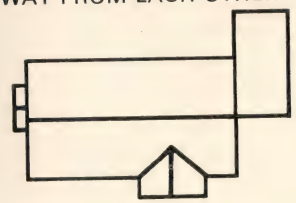
FIRST AND THIRD-ANGLE PROJECTION

2

THE VIEWS FACE OUTWARDS

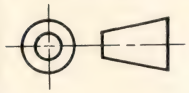


ENDS ARE AWAY FROM EACH OTHER



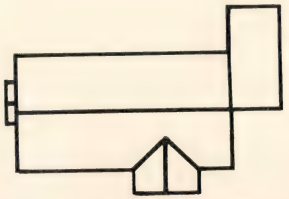
PLAN PROJECTED BELOW

FIRST-ANGLE SYMBOL



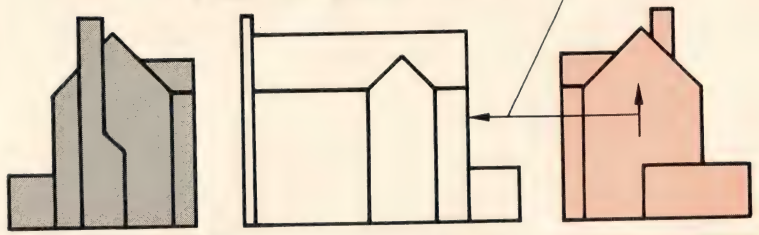
THIRD-ANGLE SYMBOL

3



PLAN PROJECTED ABOVE

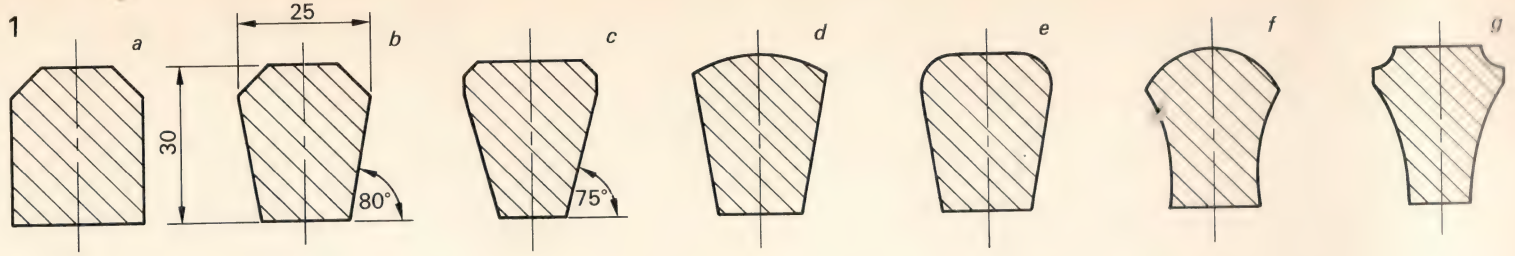
NOTE HOW THE VIEWS FACE INWARDS AND THAT THE ENDS ARE NEXT TO EACH OTHER



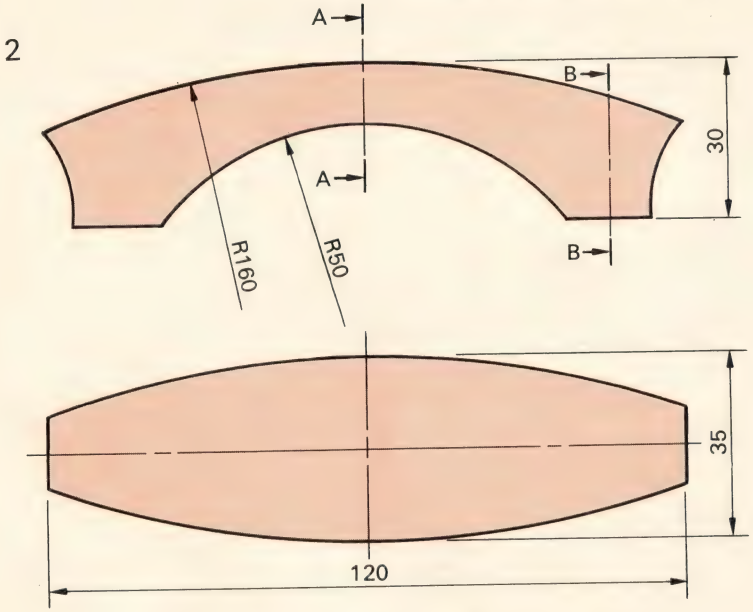
FIRST AND THIRD ANGLE (2)

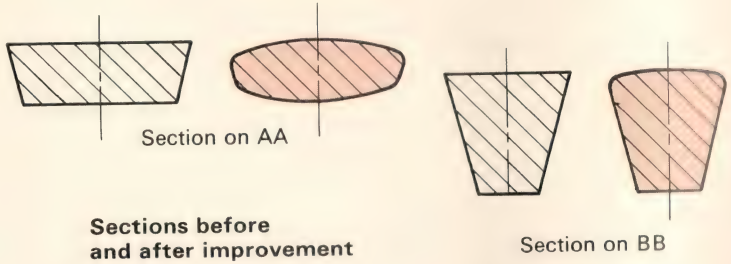
SHEET 58

The house is given as an example to illustrate the two systems of projection. Figure 1 shows views from opposite corners.
Note the projection-system symbols in Figs. 2 and 3.
Draw a similar house in both systems of projection, as given.

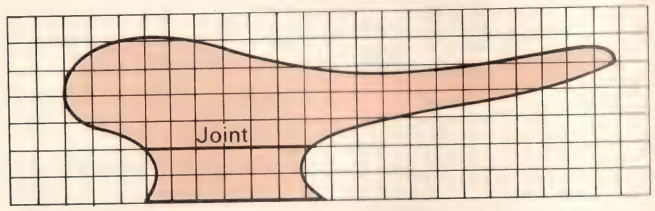


A development series of possible sections for handles or turned knobs





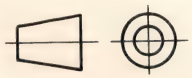
Sections before and after improvement



3

Free-shape section for entrance door handle

A JOB FOR THE WOODWORK SHOP



SUPPLY DETAILS NOT GIVEN

WOODEN HANDLES

SHEET 59

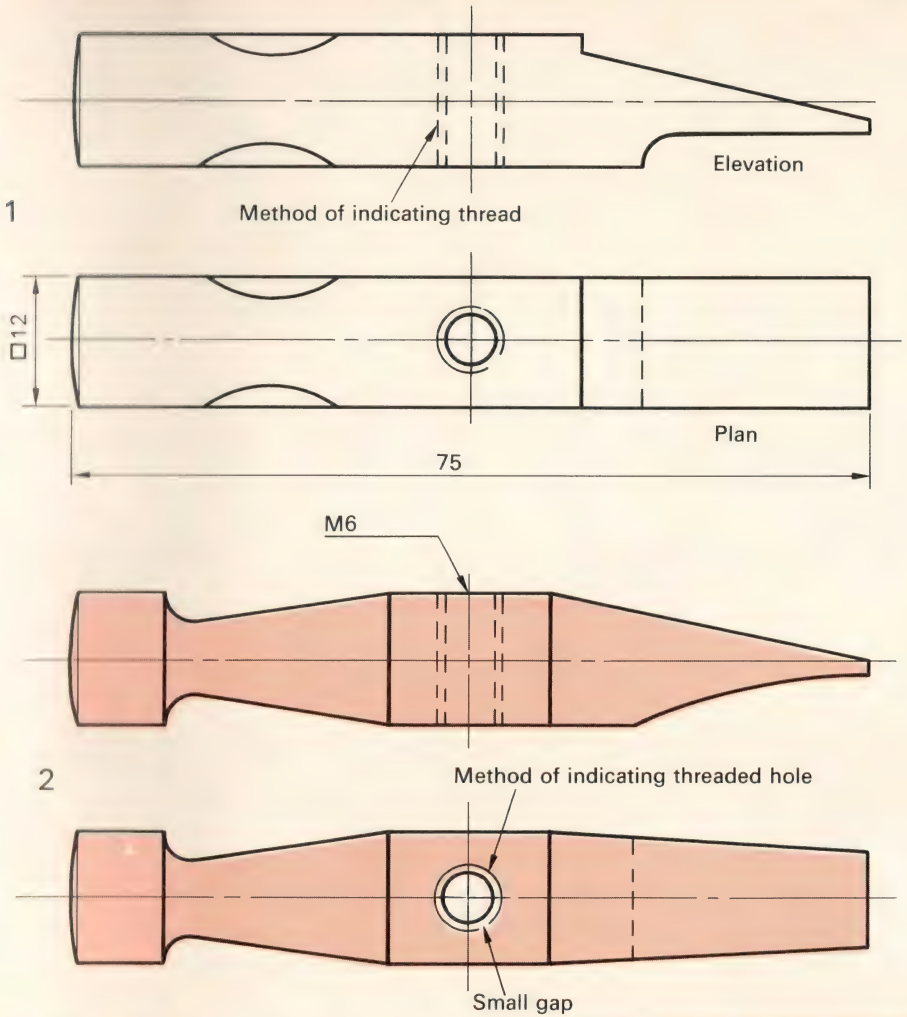
The handles on the sheet are only some of those it would be possible for you to make in the woodwork shop for use on doors or drawers. Some of you may wish to make your handle into a split pattern so that it could be cast in aluminium.

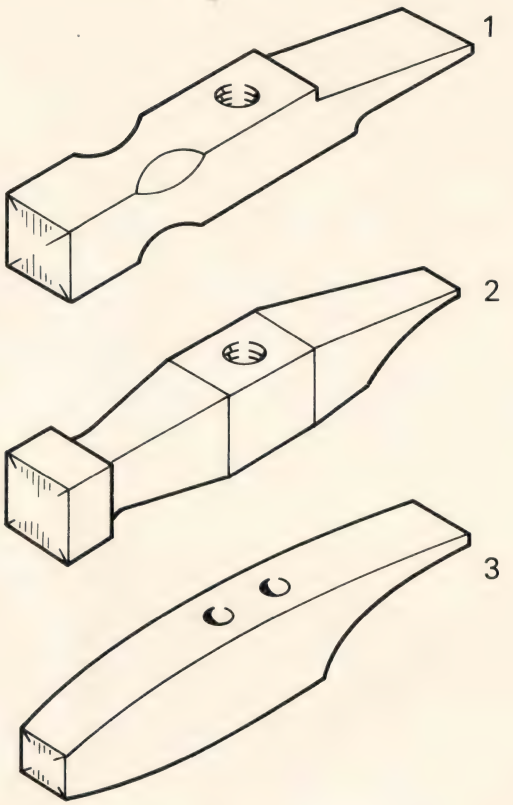
These designs are not supposed to be perfect, but they are clearly labelled as a development series of sections and elevations. This enables accurate profiles to be obtained which give an idea of suitability. Simple to complex styles are shown. Figure 2 has been developed as far as desirable, though as a drawing certain hidden-detail lines are missing.

Refer to Sheet 94 on ergonomics and consider handle shapes in relationship to fingers.

Exercises

1. Using the basic section size given in Fig. 1, but supplying all other sizes, draw a closely similar series and an improved series entirely of your own ideas.
2. Draw a series of six handle elevations to your design. Make pictorial sketches of three of these.
3. Make accurate drawings of the handle in Fig. 2, including the finished sections and dimensions. You will need to use an extension bar on your compasses.
4. Within the grid in Fig. 3 is a section of a free-shape handle. This must remain the same shape, but be increased to twice the given size. Draw another grid of ten millimetres square units, and plot the points of intersection between the grid lines and the free curve. Join these points with a smooth freehand line.
5. Using the section enlarged from Fig. 3, or one of your own design, make a series of completed development drawings for a free-shape door handle. Include a plan view and transverse sections.
6. Make this handle (in the above exercise) as a project in woodwork.





DESIGN YOURSELF A HAMMER

SUPPLY DETAILS NOT GIVEN

TACK HAMMER HEADS

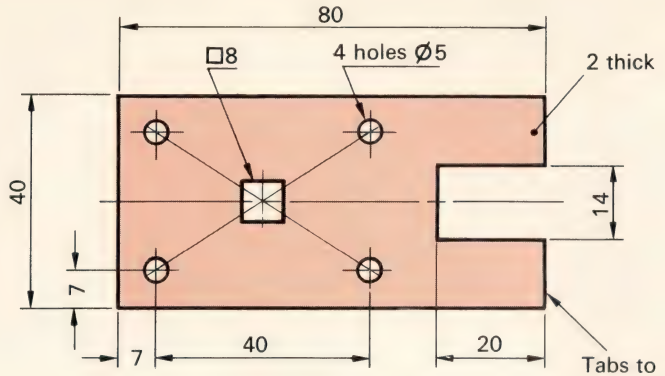
SHEET 60

In the school metalwork room, small hammers can be made which are suitable for small jobs around the house. The heat-treated head can be screwed or brazed to a mild-steel shaft, which in turn is screwed to a turned aluminium handle.

The design of the head offers scope for you to plan your shapes. After preliminary sketching activity, a development series of plans and elevations can be drawn leading to the finished drawing which may be worked to in the workroom.

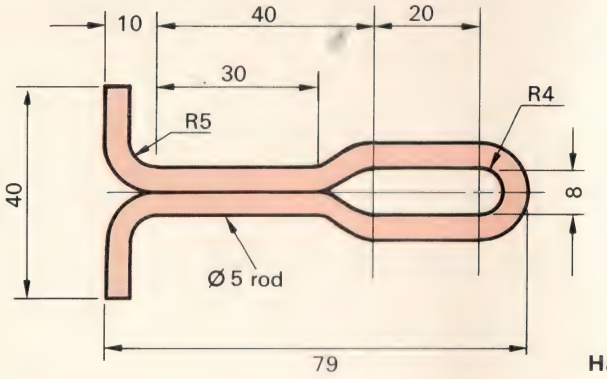
Exercises

1. Using the three sizes given, but supplying all others yourself, draw the hammers in Figs. 1 and 2, including their pictorial sketches.
2. Using your own ideas entirely draw a similar series.
3. Develop drawings for the sketch in Fig. 3. The two holes are for use with a loop-handled hammer.
4. Using wood in the woodwork shop develop a model hammer head, four times full-size, and suitable for use as a geologist's hammer, or an ice-breaking hammer. Draw the hammer full-size.



Hasp plate

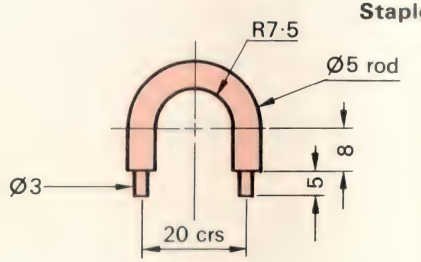
Hasp hot bent to shape on special jig

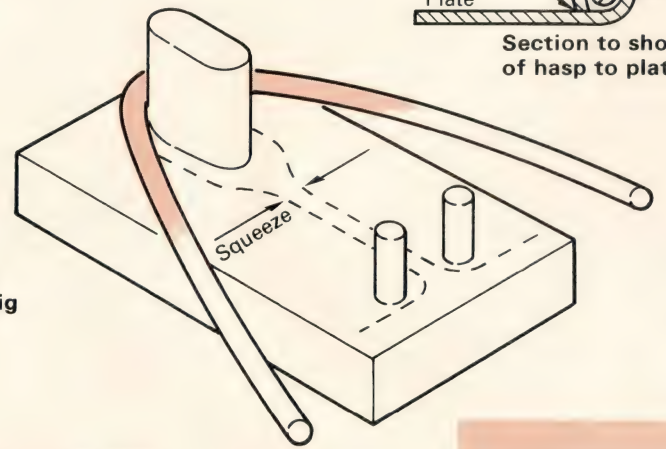


Hasp

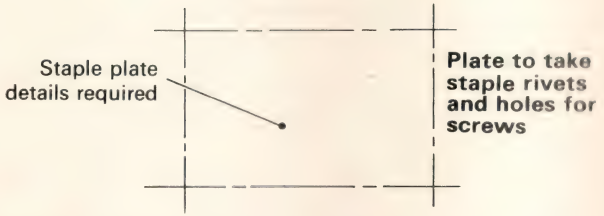
Section to show fitting of hasp to plate

Staple





Proposed bending jig

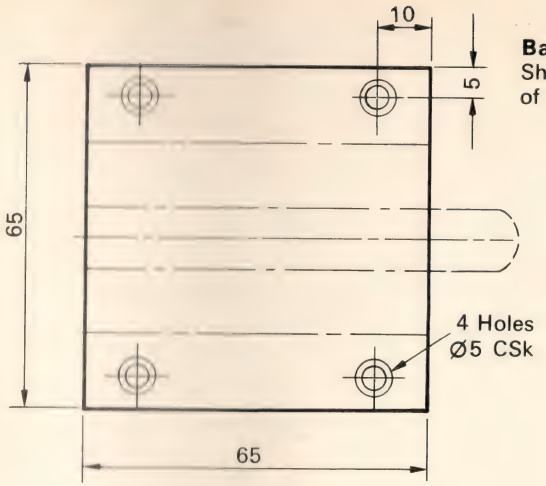


MATERIAL MILD STEEL

HASP AND STAPLE	SHEET 61

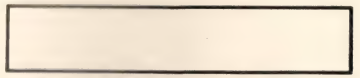
Exercises

1. Copy the drawings of the separate parts and the sketch of the bending jig.
2. Design a staple plate to which the staple can be riveted. Include all dimensions.
3. Make full working drawings for the design of the bending jig given in the sketch. Include constructional details.



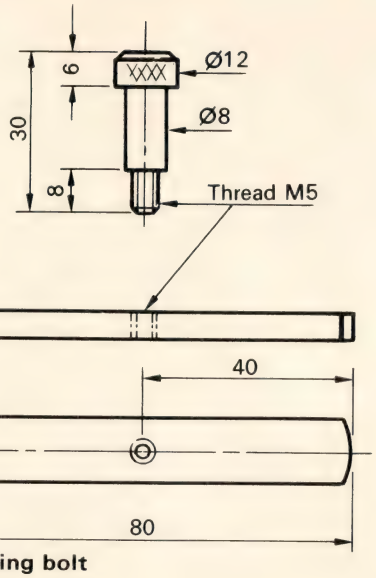
Back plate
Showing position
of top plate and bolt

Back and top plates 2 thick

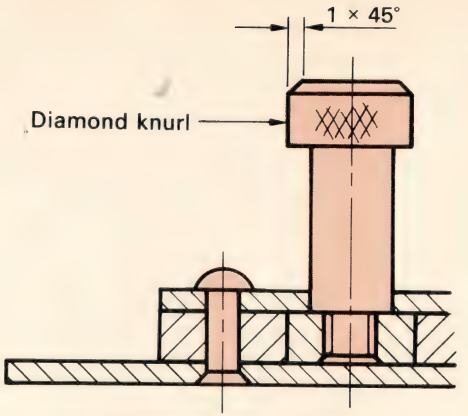


Two guide strips 5 thick

Turned knob
from Ø12 rod

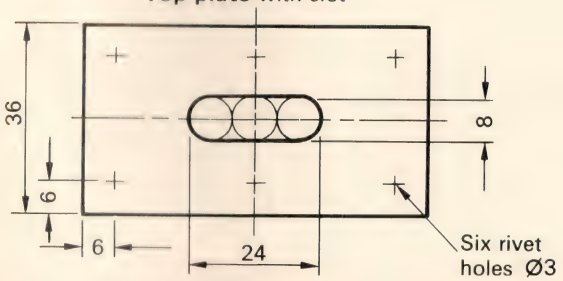


Sliding bolt



Enlarged section to show
plates, guide strips, rivets,
bolt, and knobs.

Top plate with slot



MATERIAL MILD STEEL

A BOLT ON A DOOR IS NO USE
WITHOUT A CATCHPLATE ON THE
DOOR JAMB
DESIGN A CATCHPLATE TO TAKE SCREWS
AND THE SLIDING BOLT
YOU ARE GIVEN SOME MILD STEEL
SHEET 30 × 30 × 2

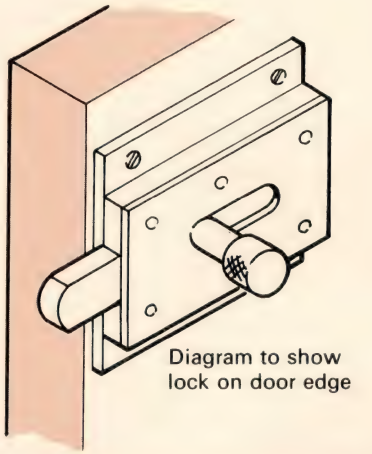


Diagram to show
lock on door edge

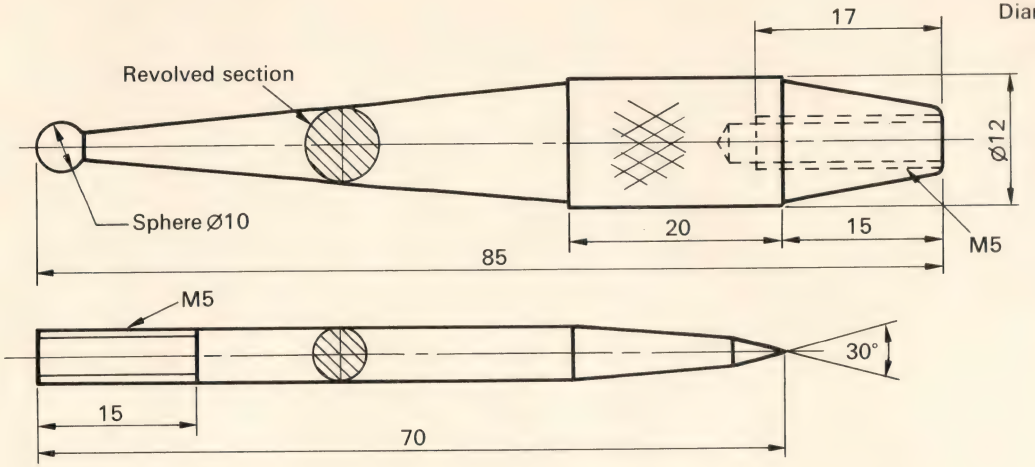
DOOR BOLT — SHEET 62

Note the methods of indicating screw threads and knurling. In the section, note that the separate parts are lined in opposite directions. The rivet and turned knob are not sectioned, but are shown as outside views. The screw thread is not sectioned.

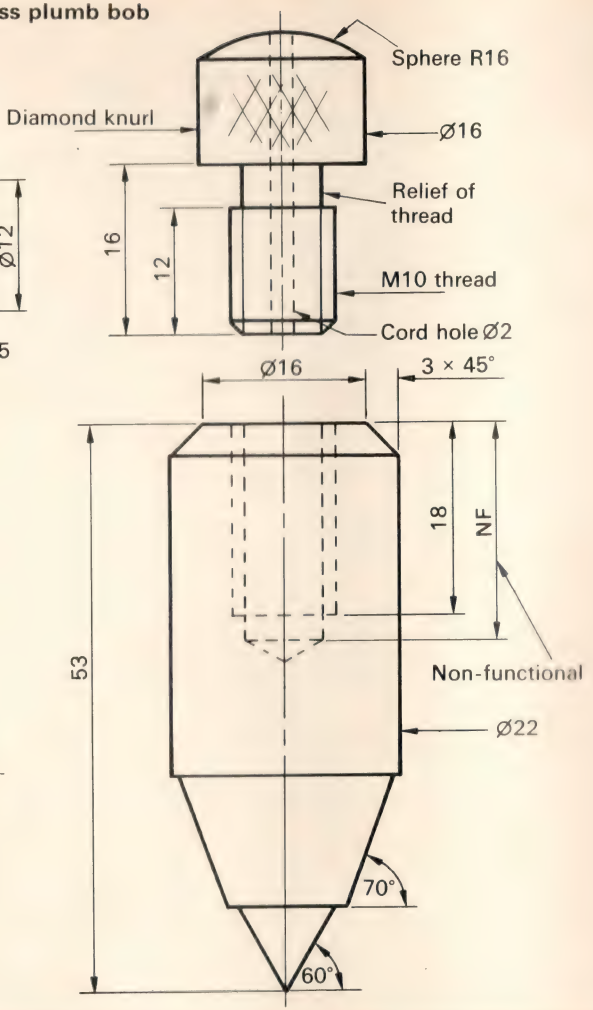
Exercises

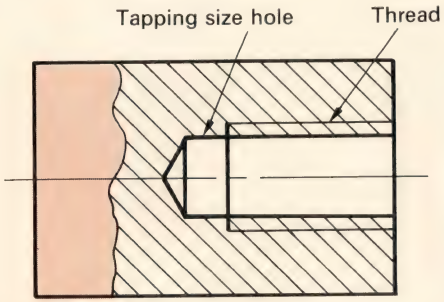
1. To a scale of 2:1, make an assembly drawing with the bolt knob in the central position. Include a plan, elevation, and sectional end elevation taken through a rivet and the knob. Do not include hidden detail. Fully dimension and annotate.
2. Design and make working drawings for a catchplate.

1 **Scriber**
Turned handle in brass
blade in silver steel

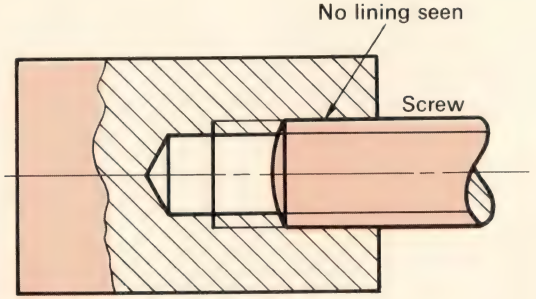


2 **Brass plumb bob**





3 **Part section showing threaded blind hole.** Section lining covers the thread



4 **Part section of threaded blind hole with screw in position.** Screw covers internal section lining

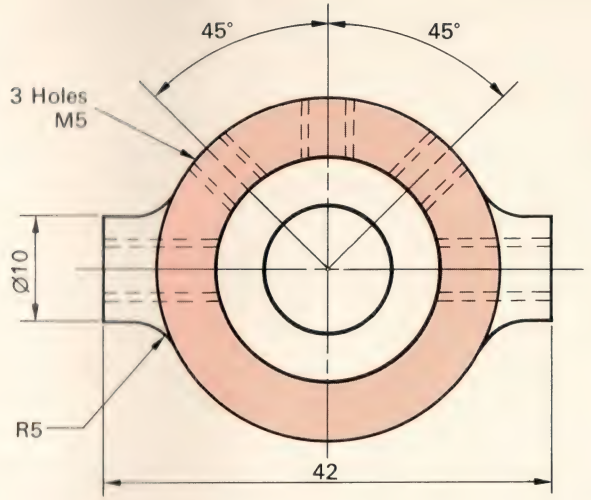
SUPPLY DETAILS NOT GIVEN

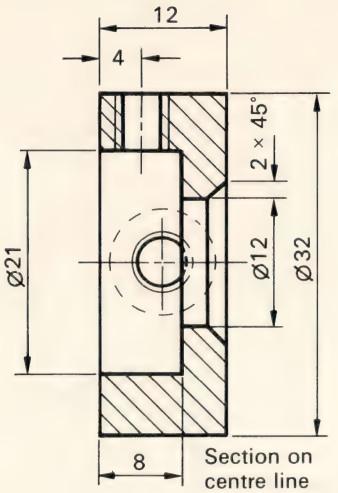
SCRIBER and PLUMB BOB — SHEET 63

Note the revolved sections on the scriber handle and blade, and the sections through blind, threaded holes.

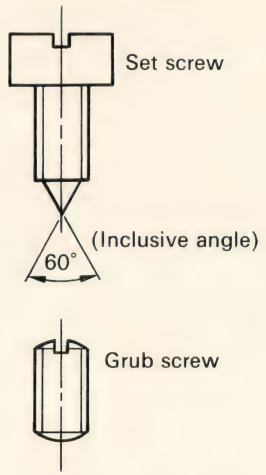
Exercises

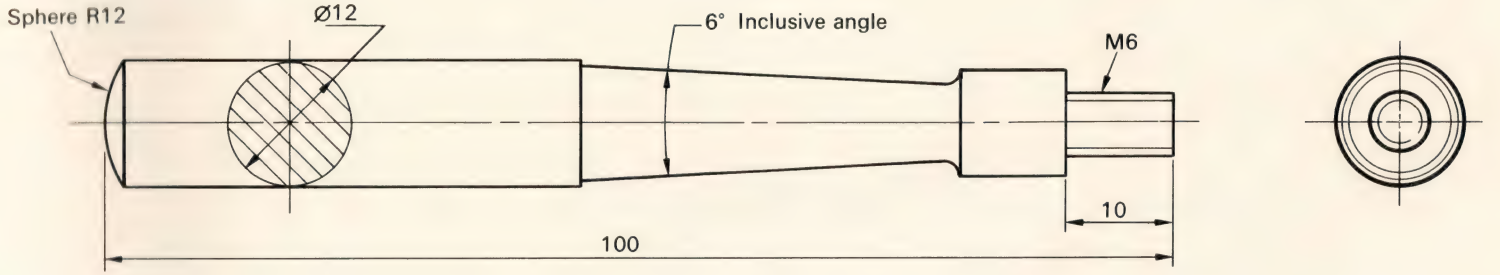
1. To a scale of 2:1, make assembled drawings of the scriber and plumb bob.
2. Obtain a centre punch, or nail punch, from the workshops. Study and make large-scale drawings of it. Show dimensioning, including angles.
3. Examine and make drawings of a tailstock centre and a driving centre for a woodwork lathe. Approximate the dimensions of the Morse taper, or consult reference tables.
4. Study and draw a revolving tailstock centre. Obtain trade literature for sectional information on the thrust bearings.





Adjusting screws





SUPPLY DETAILS NOT GIVEN

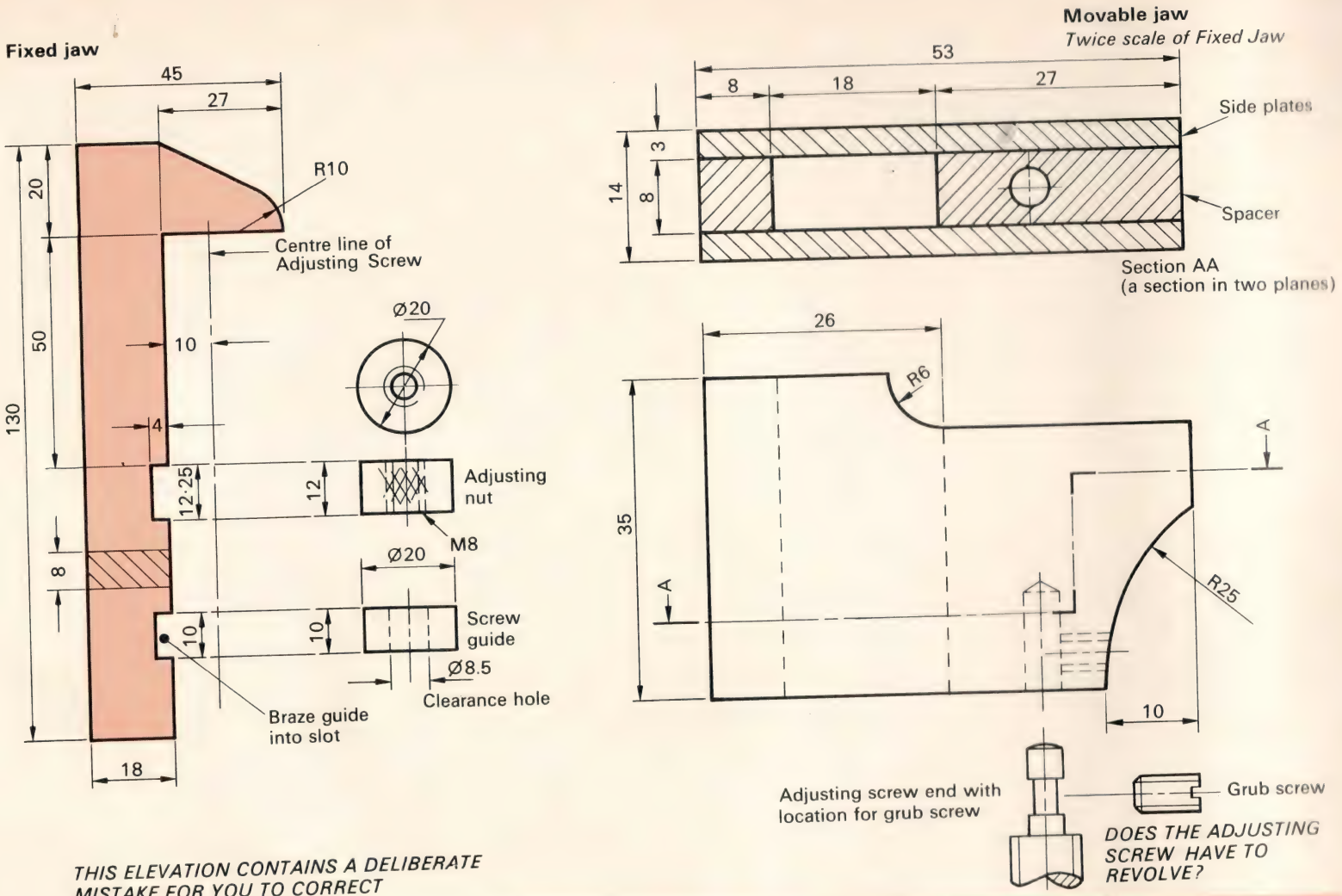
CIRCULAR DIE HOLDER

SHEET 64

The die-holder is drawn in third-angle projection to show the recessed die hole facing inwards.

Exercises

1. Draw the separated parts to a scale of 2:1.
2. Draw a local section which illustrates the screwed portion of the handle located in one end of the die holder. Choose a large scale.
3. Obtain a tap wrench. Study and make separated drawings to show its construction. Include sectional views.



THIS ELEVATION CONTAINS A DELIBERATE MISTAKE FOR YOU TO CORRECT

SUPPLY DETAILS NOT GIVEN

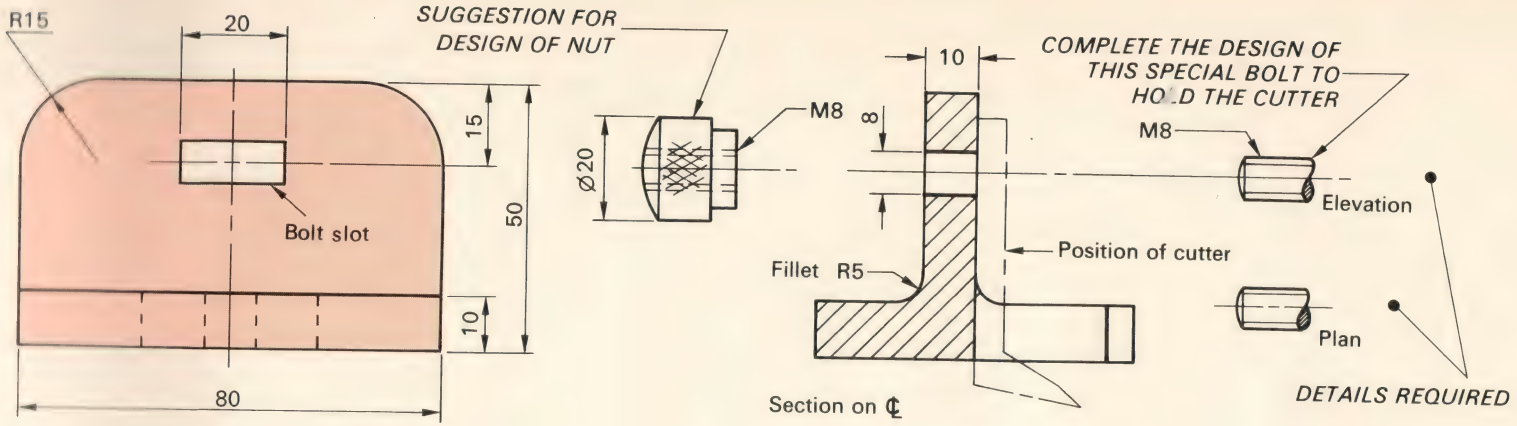
ADJUSTABLE SPANNER

SHEET 65

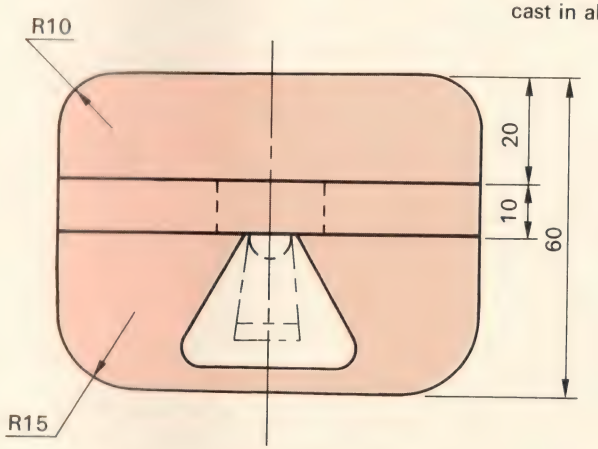
Note the section in two planes which gives maximum information about the adjusting-screw location hole and the full width.

Exercise

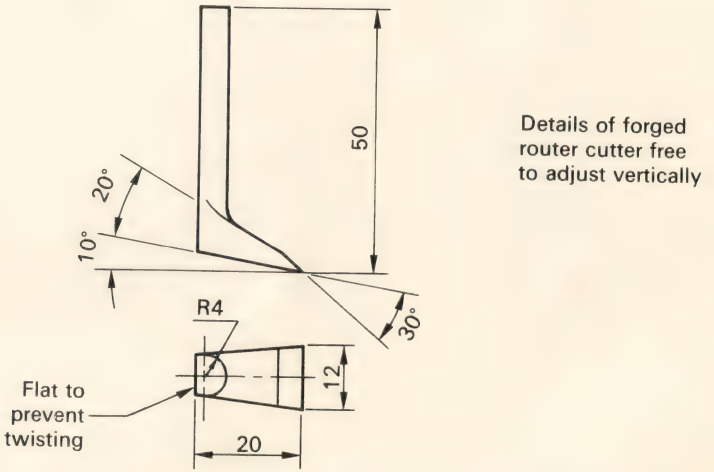
1. To a scale of 2:1, make an assembly drawing of the spanner after the deliberate mistake has been corrected. Determine suitable points on the movable jaw for rivets to be used between the side plates and spacers.



Body of router cast in alloy LM4



Plan showing blade in relation to mouth and slot



Details of forged router cutter free to adjust vertically

SUPPLY DETAILS NOT GIVEN

SMALL ROUTER PLANE

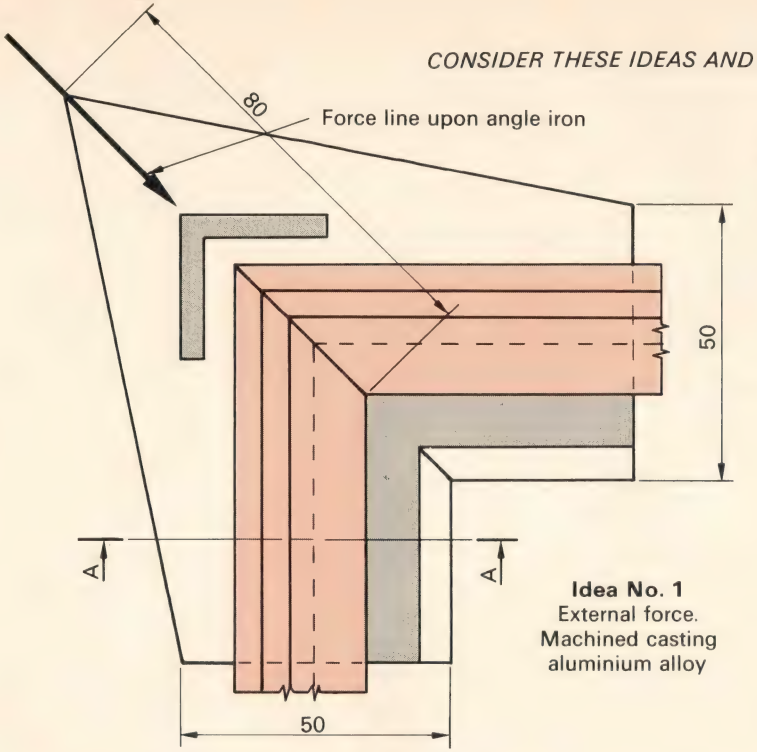
SHEET 66

The drawings show the body and blade of a router plane which could be made in the school metalwork room.

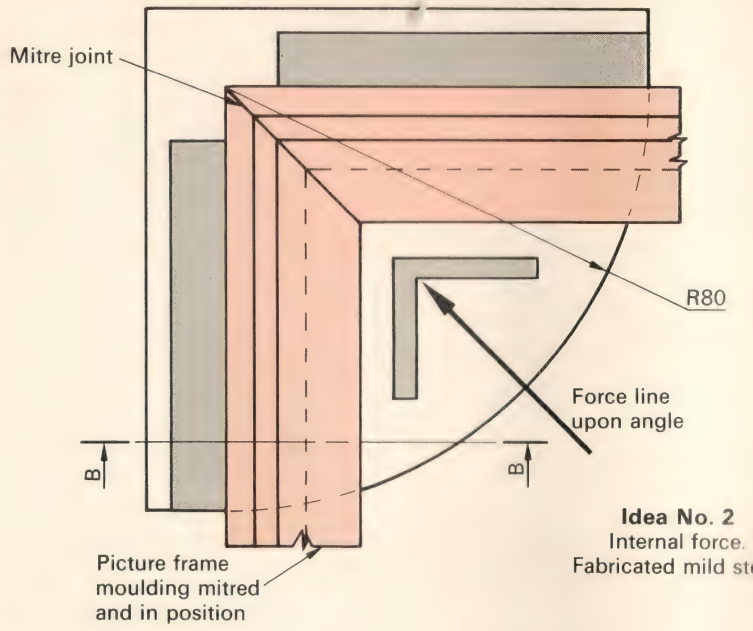
Details of the bolt which is to fasten the blade are not given. It is for you to design within the limits indicated. The thread is shown as M8, and the head fits into a slot to prevent twisting when being tightened by the nut.

1. Make an accurate drawing of the separate parts as given, including the remaining details of the nut.
2. With sketches, diagrams, and final working drawings complete the design for the bolt.
   Draw a section to show the bolt, blade, and nut in position.
3. Make a series of technical diagrams or sketches illustrating the making of any one part of the router.

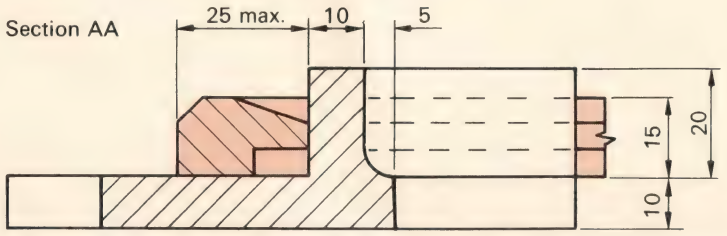
CONSIDER THESE IDEAS AND DEVELOP ONE OF THEM

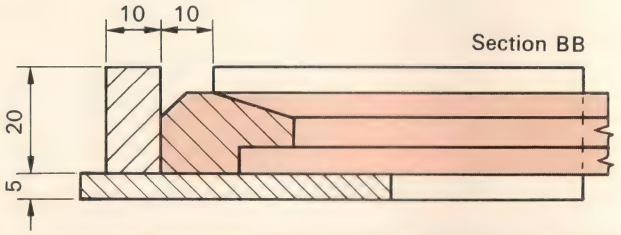


Idea No. 1
External force.
Machined casting
aluminium alloy



Idea No. 2
Internal force.
Fabricated mild steel





SUPPLY DETAILS NOT GIVEN

MITRE CORNER CLAMP

SHEET 67

When making small picture frames, it is very convenient to be able to press the mitred corner joints together and hold them in place while the adhesive sets.

The drawings show two undeveloped ideas for such a corner cramp, which could be perfected for use in the school or home workshop.

In either case, the basic framework is given, together with a portion of jointed frame moulding in its fixing position. Details of the mechanism which acts to hold the joint have not been given; it is for you to design.

It is suggested that the pressure upon the moulding follows the single force line as indicated, and is distributed near the mitre through a loose angle piece.

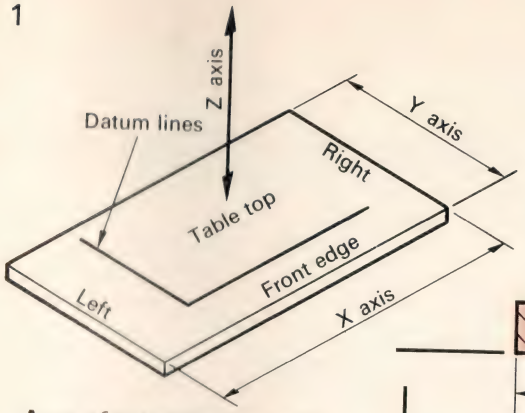
The design should be limited to a moulding of 25 mm max. width.

You must supply all sizes not given. You *are* allowed to alter given sizes according to your own improvements.

Exercises

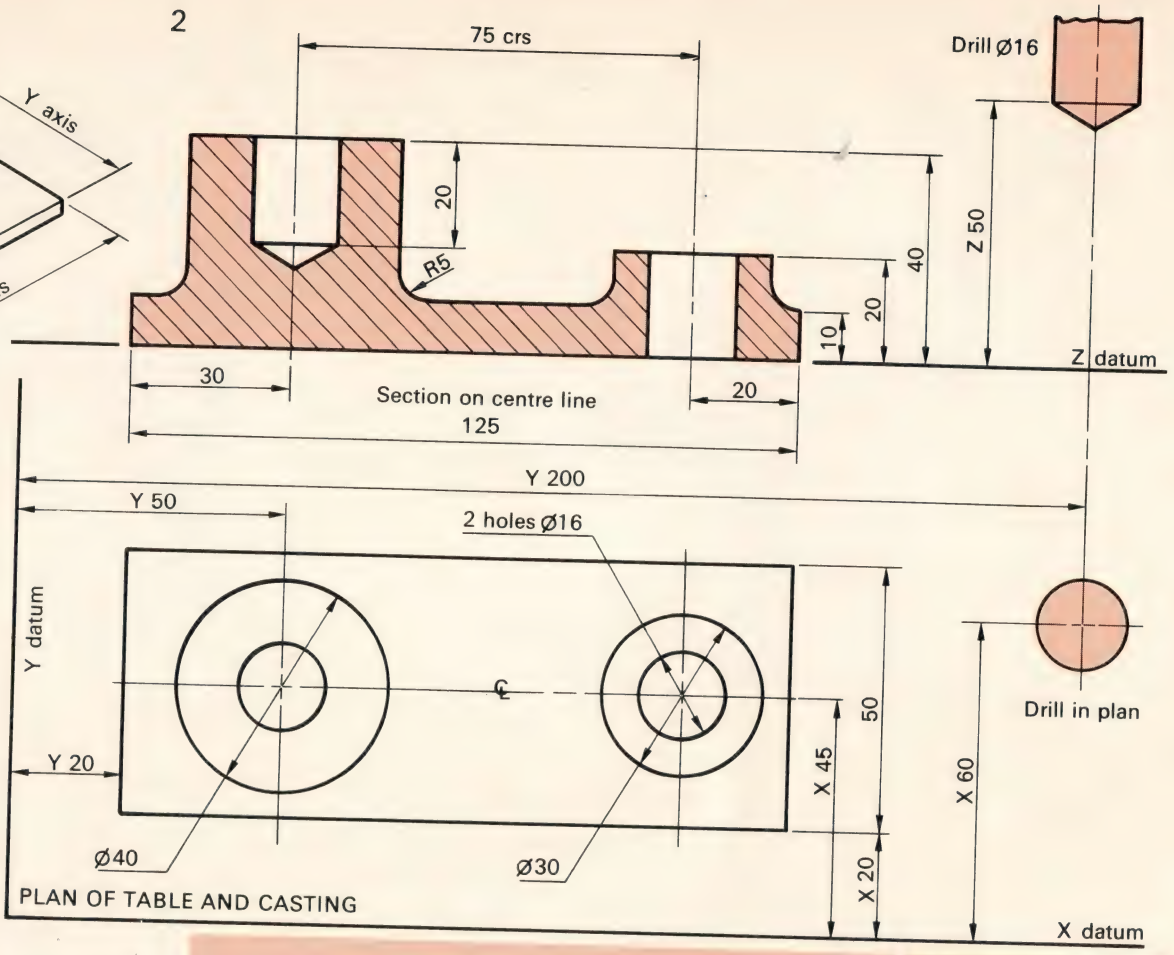
1. Hold a class–teacher discussion on the merits, or otherwise, of the designs. Write short, but clear, notes of the criticisms and suggestions for refinement.
2. Make sketches, notes, and development diagrams of your ideas for the cramping mechanism for the better of the two given arrangements. Make sure that this will fit the framework, which could be modified if necessary. It is suggested that the mechanism should be attached to the base free to pivot.
3. Make full working drawings of the design for the mechanism.
4. Make the complete cramp in the school workroom.

1



Axes of movement of drill in relation to machine table

2



TAPED INSTRUCTIONS CAN BE FED INTO A MACHINE, WHICH IS THEN CONTROLLED TO MOVE IN THE RIGHT DIRECTION AND CUT IN THE RIGHT PLACE

SUPPLY DETAILS NOT GIVEN

MACHINE OPERATION

SHEET 68

In industry, some machines are controlled by coded, punched tape fed into the machine computer. It is very important for the draughtsman to plan the exact path of the cutting tool, so that no mistakes are made which could mean that an expensive component was scrapped.

The dimensions on the drawing have to be of a highly specialized kind, which need not concern us here, but such dimensions must have a known relationship to the exact position of the cutting tool, the component, and the axes of movement.

The very simple component in Fig. 2 is not, perhaps, a true example of industry's numerically controlled machining, but it has been provided to start you thinking logically of strict sequences.

Remember, for example, that a drill which is coded to move downwards to drill a hole must also be coded to move upwards out of the hole before it can drill the next one.

Movement of the cutter takes place along, or parallel to, the axes shown in Fig. 1. Positive and negative values indicate directions along an axis: negative being to the left along the *X* axis; to the front along the *Y* axis; and downwards along the vertical *Z* axis. This is similar to the values on a graph.

One path sequence of a drill and its code can be seen in the following table:

Stage 1	moves 40 mm to right	code equals $+X$ 40
Stage 2	moves 30 mm to front	code equals $-Y$ 30
Stage 3	moves 60 mm downwards	code equals $-Z$ 60
Stage 4	moves 60 mm upwards	code equals $+Z$ 60.

The exact positions of the drill and component in plan and elevation are given from fixed datum lines. The *Z* datum is, of course, the machine table surface.

Exercises

1. Make an accurate drawing of the component in Fig. 2. Include the exact position of the drill and datum lines. Add all given dimensions and others which will help you.
2. Determine a desirable path sequence for drilling both holes and returning the drill back to its starting point.
3. Design another component which has four holes to be drilled. The holes are each of the same size, but are not on a common centre line. Give the datum and drill positions and all dimensions. If necessary, consult books on engineering drawing. Exchange your drawing in class, so that you have to write the path sequence for someone else's component and he has to write one for yours. Join up and check for correctness.

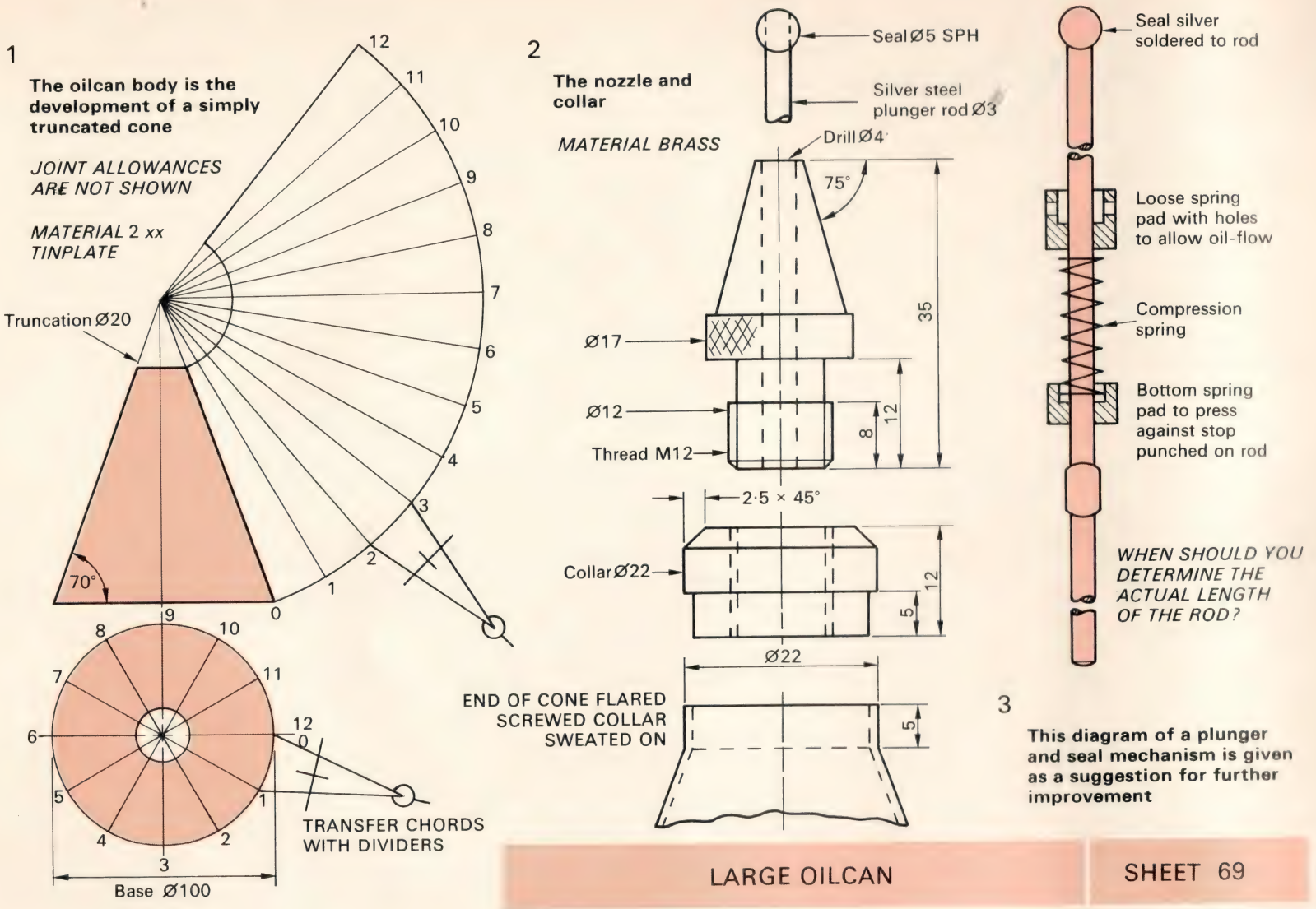
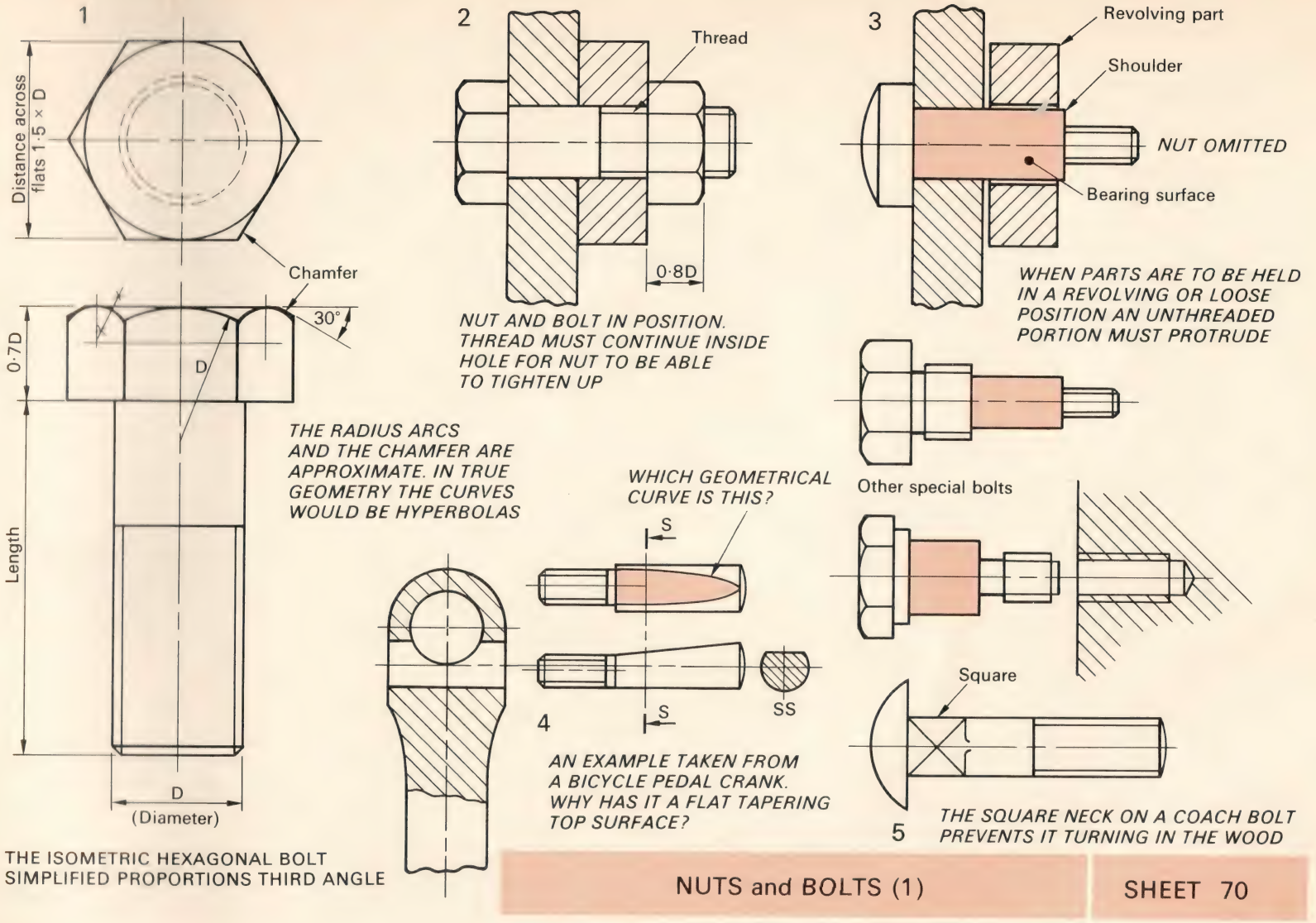


Figure 1 shows, to a reduced scale, the plan and elevation of the body of the oilcan and the development of its curved, conical surface.

A *development* is the term used to describe the surfaces of an object when they have been laid out upon one flat sheet of material out of which the object is to be made

Exercises

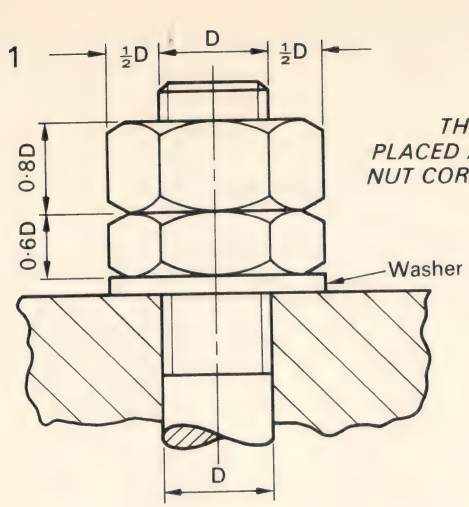
1. Draw the full-size plan and elevation of the oilcan and obtain the 'development' as shown.
2. The separated parts in Fig. 2 show a completely outside view of the neck, nozzle, collar, and seal. To a scale of 2:1, and with the parts assembled, draw them in a half-sectional view. Section the half to the right of the centre line.
3. Make a large-scale drawing of the top spring pad in Fig. 3.
4. Make a procedure chart of either diagrams or sketches to illustrate the design and stages in making the oilcan bottom.

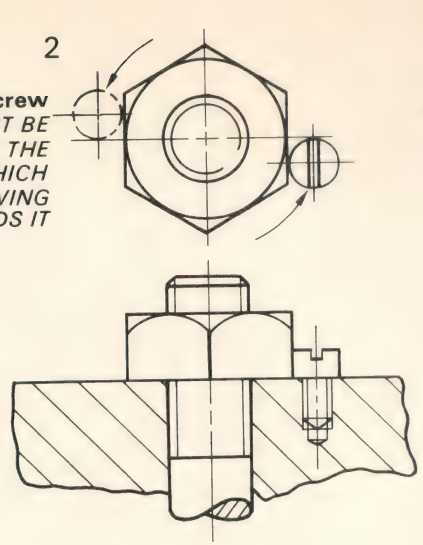


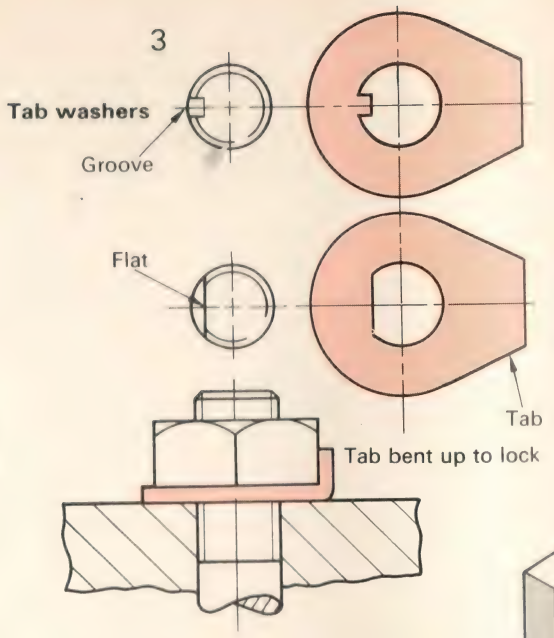
The method shown in Fig. 1 for drawing a standard ISO metric bolt is an approximate method, but widely recognized as being acceptable. Another approximation for the size of the hexagonal head in relation to the bolt diameter is to make the distance across the corners of the hexagon equal to twice the bolt diameter (2*D*). This second method produces a larger head. Note the convenience of third-angle projection.

Exercises

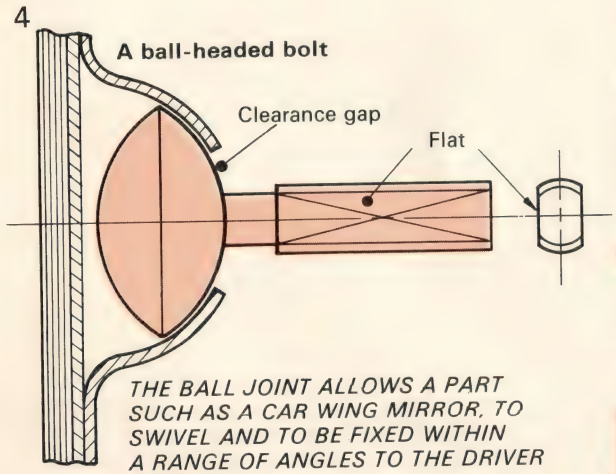
1. Draw the bolt in Fig. 1. Start by drawing the chamfer circle equal to the distance across the flats.
2. Draw the sections in Figs. 2, 3, and 5.
3. Before you draw the example in Fig. 4, try to obtain the actual object for study.



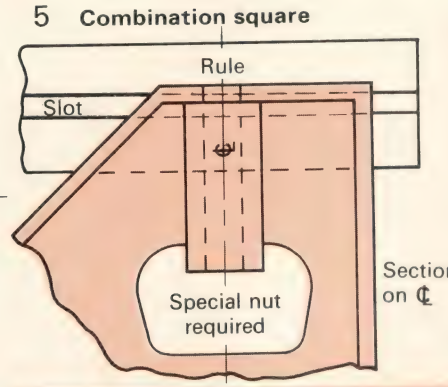


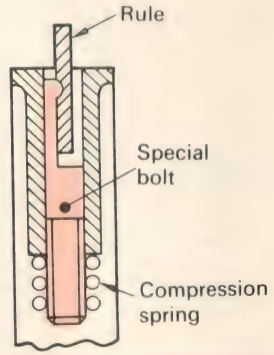


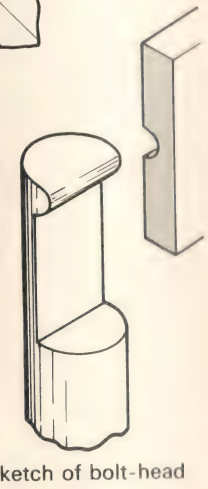
Lock nuts WHEN THE NUTS HAVE BEEN TIGHTENED DOWN THE TOP NUT IS HELD WHILE THE SMALL NUT IS REVERSED AGAINST IT SLIGHTLY



THE BALL JOINT ALLOWS A PART SUCH AS A CAR WING MIRROR, TO SWIVEL AND TO BE FIXED WITHIN A RANGE OF ANGLES TO THE DRIVER







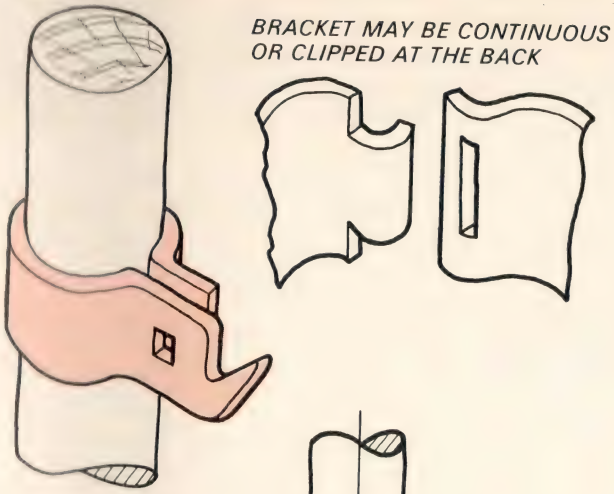
NUTS and BOLTS (2) SHEET 71

The series in Figs. 1 and 3 shows some of the many methods of locking nuts in position. In this instance, the nuts have been drawn to the 2*D* proportion across the corners.

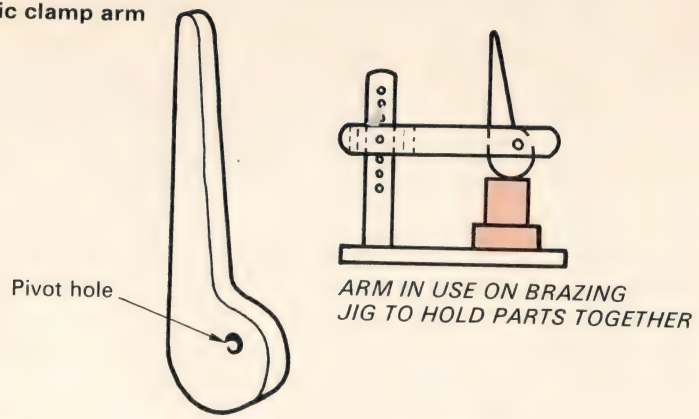
Exercises

1. Draw Figs. 1 to 3.
2. Draw Figs. 4 and 5. Try to obtain the actual parts for study.
3. Obtain and sketch further examples of the use of the ball- or spherical-headed bolt. For instance, it can be used for adjustable light fittings, camera stands, G-cramps, trailer towing, or anywhere that rotary or wide-angled movement is required.

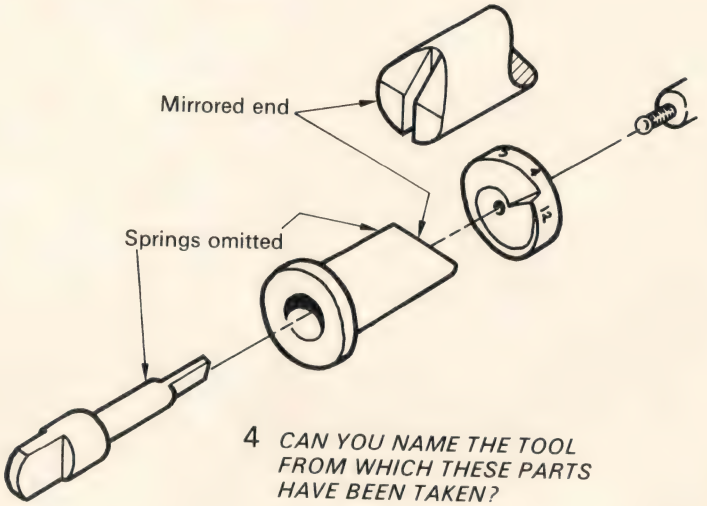
1 **Tent-pole bracket**



2 **Eccentric clamp arm**



3 **Scribing block clamp**



4 *CAN YOU NAME THE TOOL FROM WHICH THESE PARTS HAVE BEEN TAKEN?*

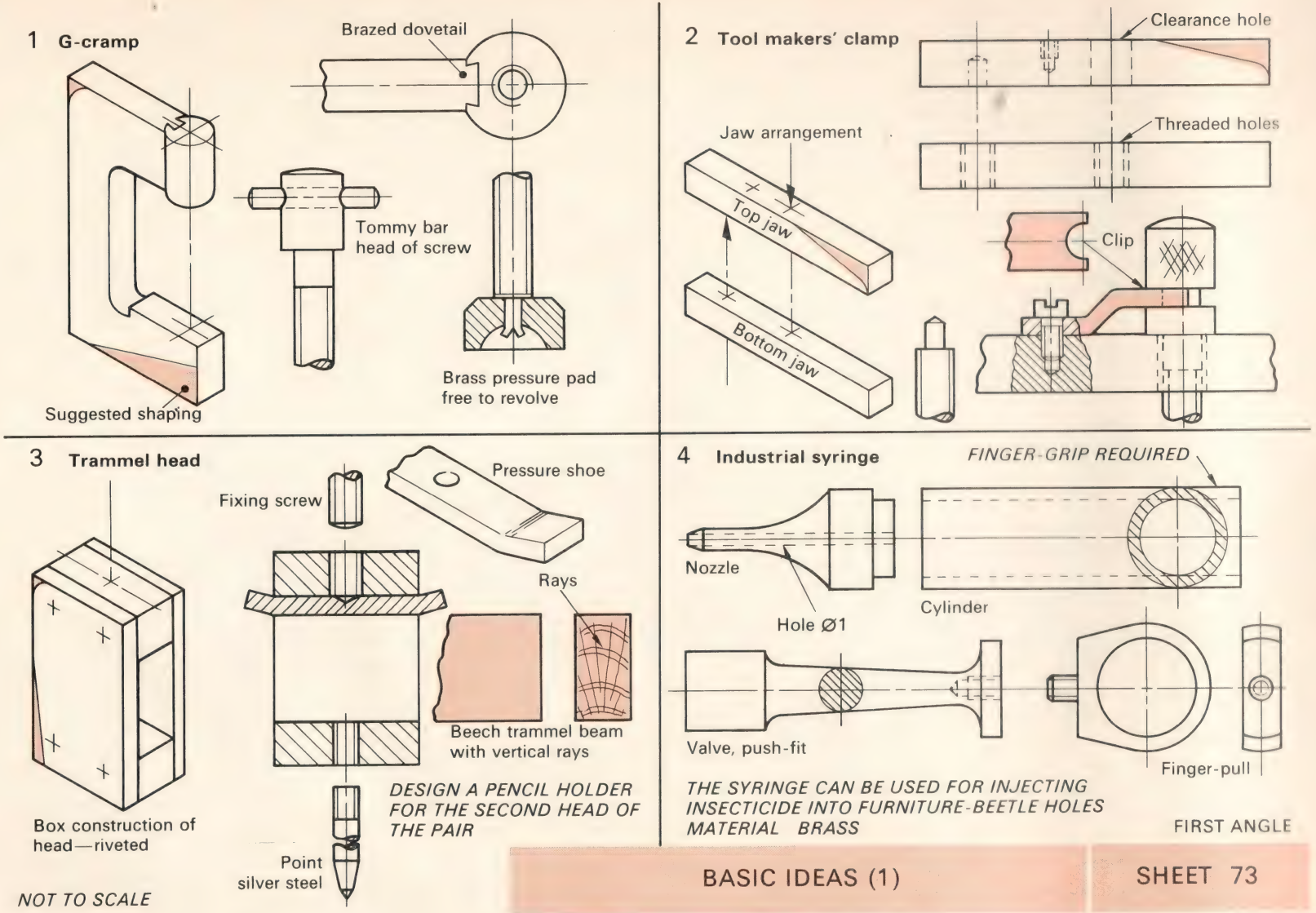
FITTINGS and GADGETS — SHEET 72

There is, perhaps, little difference between some fittings and gadgets and special nuts and bolts. The four examples given are but few of many.

Exercises

1. Draw with diagrammatic sketches the given examples, correcting and completing Fig. 3 as indicated.
2. Take apart a few unwanted gadgets and try to discover how they work. This should help you to plan other mechanisms. Consider, examine, and record some of these ideas:

springbow-compass lead holders; spectacle hinges; brace ratchet; hand-drill jaws; brace crocodile jaws; an 'Engaged' sign; keyhole-slot screwing; bayonet-type bulb holder; pocket-knife blade spring; bicycle bell; a zip fastener.



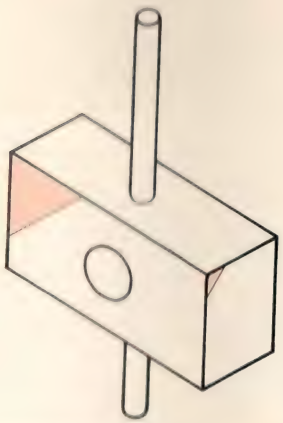
In each of the examples (on Sheets 73 and 74), you have been given sufficient information to enable you to complete the design for yourself. Before answering Exercises 4 (Sheet 73) and 2 (Sheet 74), you are advised to consult the sheets on ergonomics (Sheets 94 to 96).

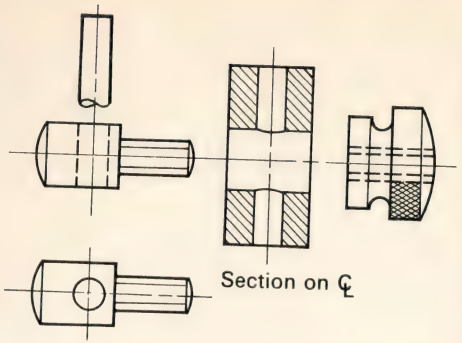
In all cases, you are allowed to improve on the given designs if you have any better ideas. For example, Exercise 1 could be redesigned to be suitable for a casting.

Present full working drawings such that you would be able to work from them in the workshop.

You may have to do some research into specialist craft books, and you are expected to have some craft knowledge and skill.

1 Depth gauge

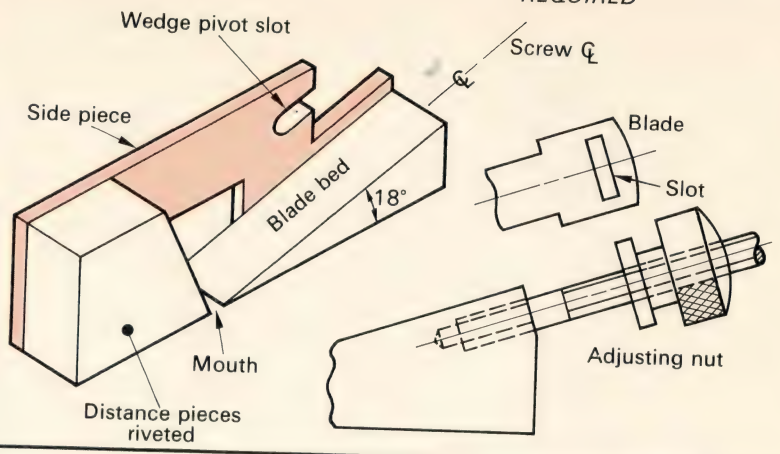




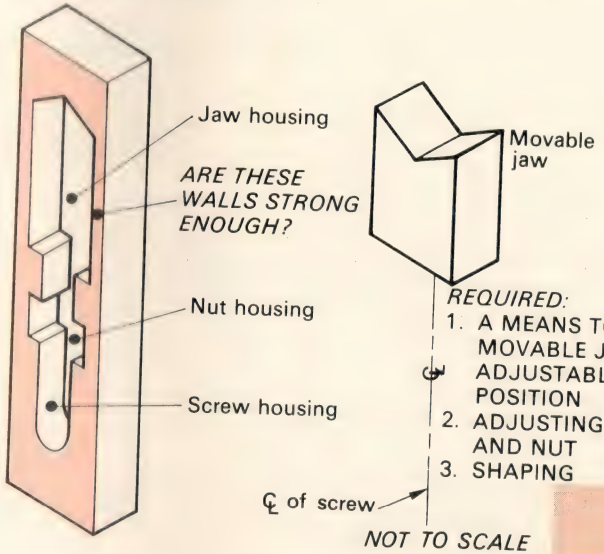
A DEPTH GAUGE IS USED TO DETERMINE THE DEPTH OF HOLES WHICH ARE TOO SMALL TO PERMIT THE USE OF A RULER

2 Shoulder plane

SHAPING AND WEDGE REQUIRED



3 Adjustable spanner

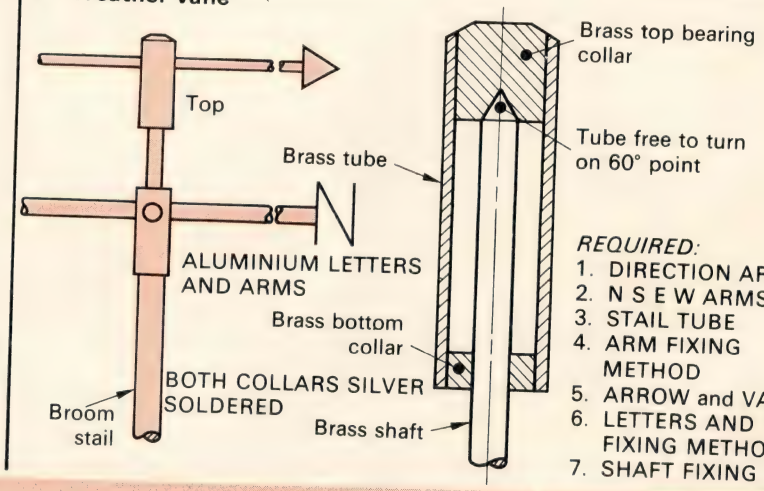


REQUIRED:

1. A MEANS TO HOLD MOVABLE JAW IN AN ADJUSTABLE SLIDING POSITION
2. ADJUSTING SCREW AND NUT
3. SHAPING

NOT TO SCALE

4 Weather vane

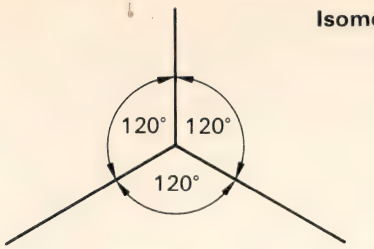


REQUIRED:

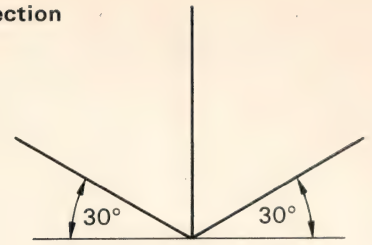
1. DIRECTION ARMS
2. N S E W ARMS
3. STAIL TUBE
4. ARM FIXING METHOD
5. ARROW and VANE
6. LETTERS AND FIXING METHOD
7. SHAFT FIXING

BASIC IDEAS (2) SHEET 74

1 **Isometric projection**

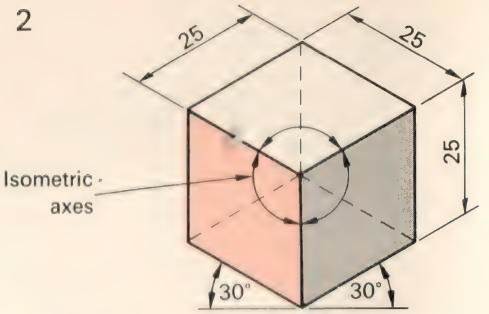


The isometric axes equally spaced ('Iso'= equal, 'Metric' = measurement)



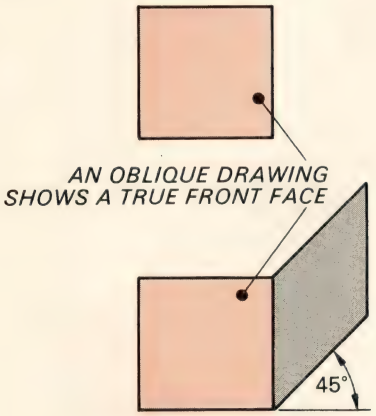
The axes in another form for the convenient use of the 30° set square

2



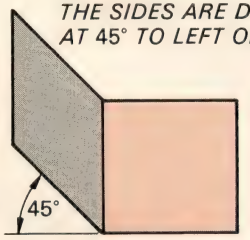
A cube in isometric

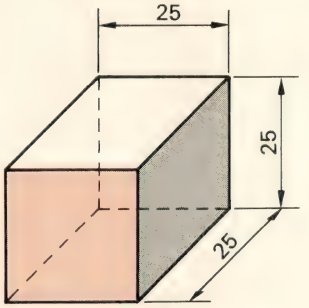
3 **Oblique projection**



AN OBLIQUE DRAWING SHOWS A TRUE FRONT FACE

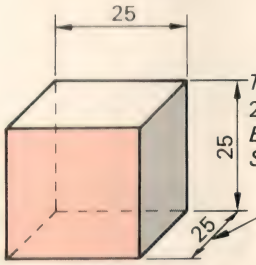
THE SIDES ARE DRAWN AT 45° TO LEFT OR RIGHT





A CUBE IN OBLIQUE APPEARS TO BE ELONGATED WHEN ALL THE FACES ARE DRAWN TO THE SAME SCALE

USE 'ISOMETRIC' OR 'CABINET OBLIQUE' FOR PICTORIAL VIEWS OF OBJECTS TO SCALE. ISOMETRIC GIVES A BETTER ALL-ROUND VIEW, OBLIQUE GIVES A TRUE ELEVATION



*A CUBE IN '**CABINET** OBLIQUE'. THE DEPTH HAS BEEN REDUCED BY HALF TO GIVE MORE REALISTIC PROPORTIONS*

ISOMETRIC and OBLIQUE PROJECTION — SHEET 75

Isometric projection is especially popular and convenient when a measured pictorial view is required. When setting off measurements in isometric, use only the axes shown in Figs. 1 and 2.

Oblique projection will give a pictorial view with a true front face.

Exercises

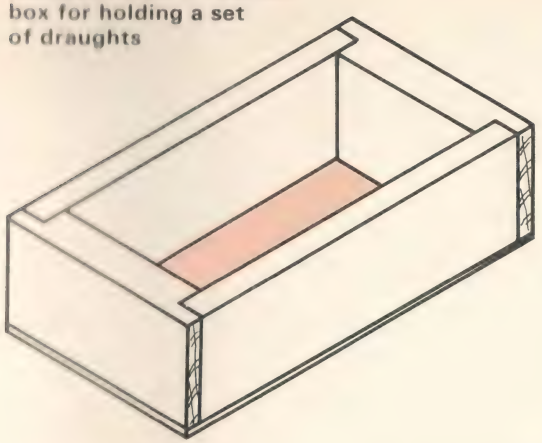
1. Redraw the given axes, cubes, and notes.
2. Make an isometric drawing of any small, rectangular object available to you. Examples:

   matchbox; cigarette packet; compass box; domino; engineer's or woodworker's square.
3. Make an isometric drawing of some straight-sided block letters, such as: 'E', 'F', 'H', and 'L'. Assume that they are cut out of plywood, 12 mm thick.
4. Make isometric drawings of some of the following letters.

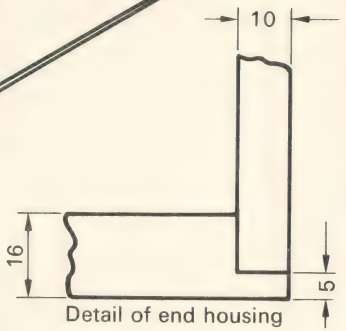
   A K M N V W X Y Z

   You must first of all draw the front elevation of the letter within its rectangular framework. Redraw the framework in isometric, and, taking distances from the elevation, plot these in the isometric frame.

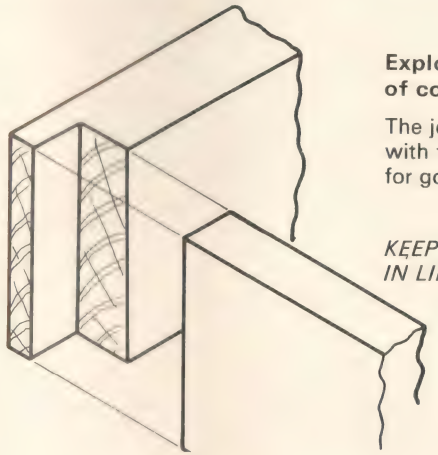
1 **Isometric view of a small box for holding a set of draughts**



DETERMINE THE CORRECT DIMENSIONS OF LENGTH, WIDTH, AND HEIGHT



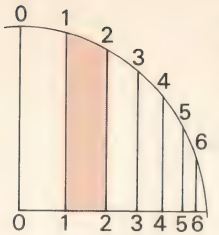
Detail of end housing



Exploded isometric of corner joint

The joint is shown with the parts separated for good illustration

KEEP THE PARTS IN LINE

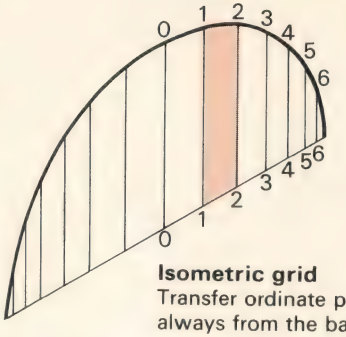
2 

A circle in isometric

DRAW THE TRUE QUADRANT OF THE GIVEN CIRCLE AND TRANSFER THE ORDINATES TO THE ISOMETRIC GRID

SPACE ORDINATES ACCORDING TO THE FALL OF THE CURVE

JOIN HEIGHTS WITH A FAIR CURVE

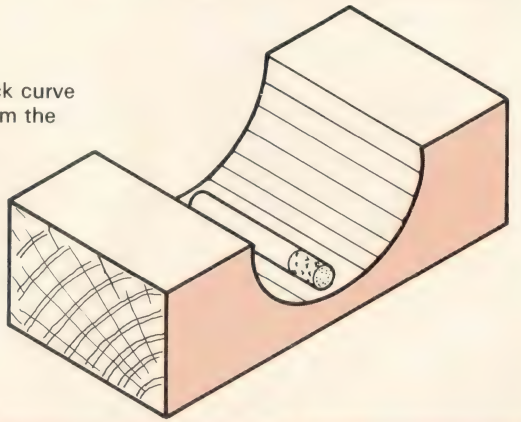


Isometric grid
Transfer ordinate points always from the base O

3 

To obtain the back curve take ordinates from the front curve and set off the width

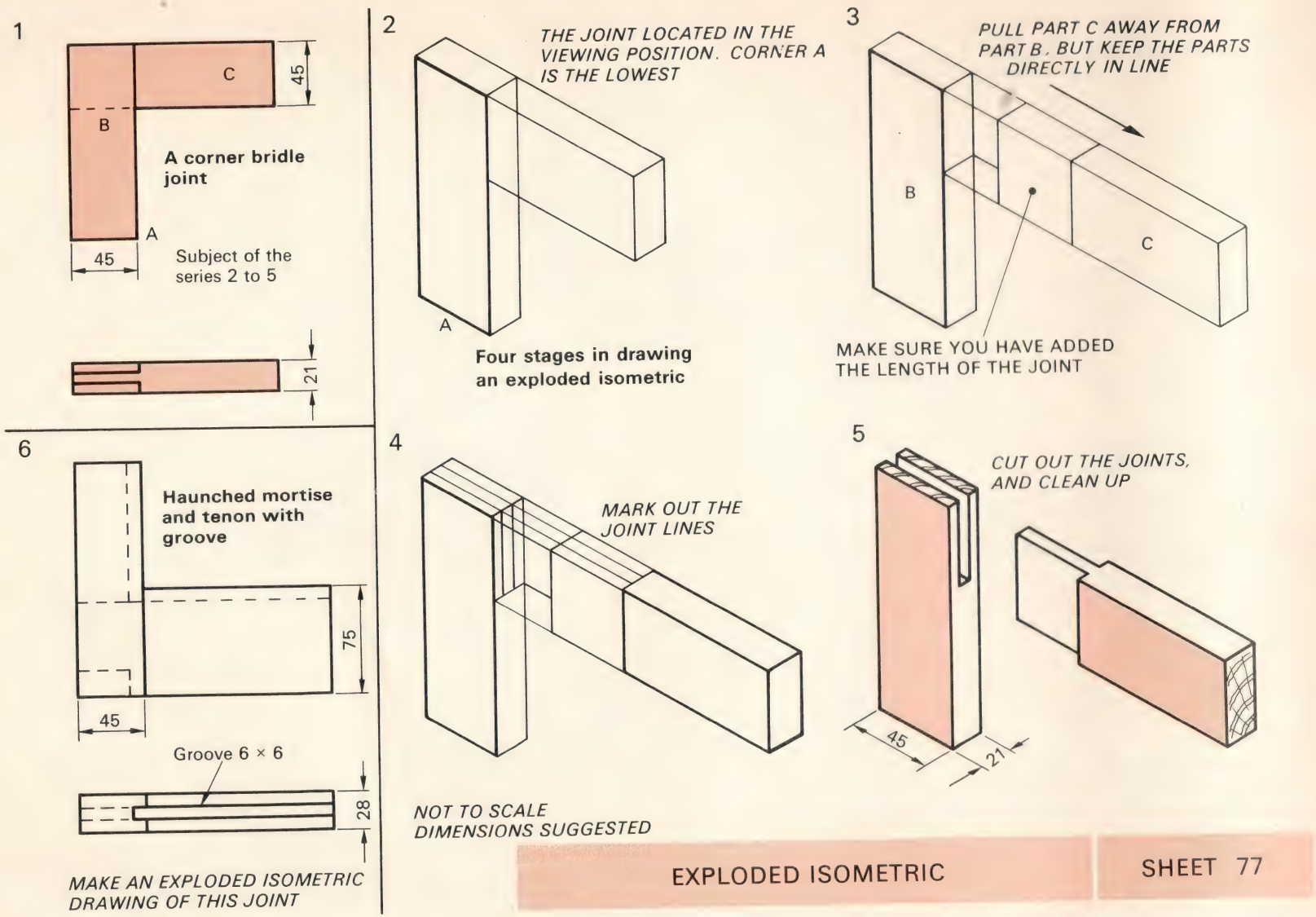
This hollowed block is a boy's basic idea for a cigarette box without joints



ISOMETRIC EXAMPLES SHEET 76

Exercises

1. Taking Fig. 1 as the basis of your design, determine the box dimensions and complete a dimensioned isometric drawing of it.
2. Study and draw the method of obtaining an isometric circle.
3. Draw the block in Fig. 3 in isometric, as given.
4. Make orthographic drawings showing the completed design for Fig. 3, as intended for a boy who doesn't like to make joints.

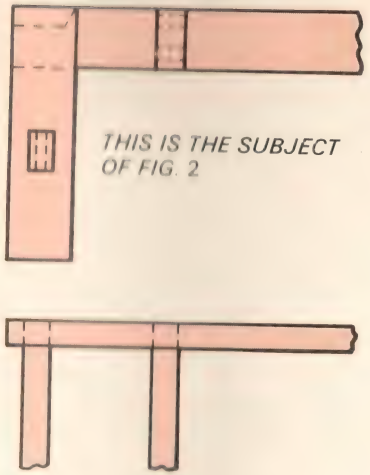


EXPLODED ISOMETRIC SHEET 77

Exercises

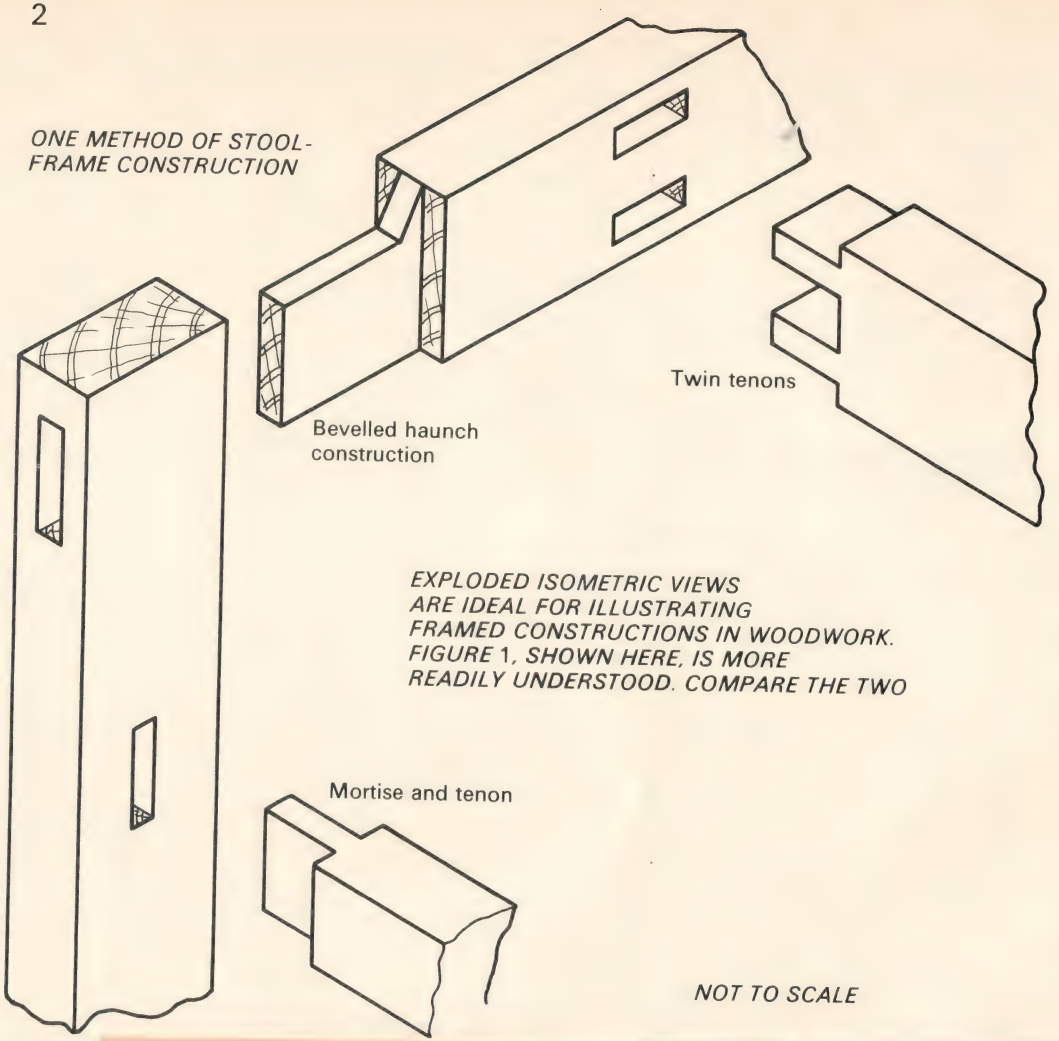
1. Redraw the series in Figs. 2 to 5, retaining the separate stages.
2. Make an exploded isometric drawing of the haunched mortise and tenon in Fig. 6.

1

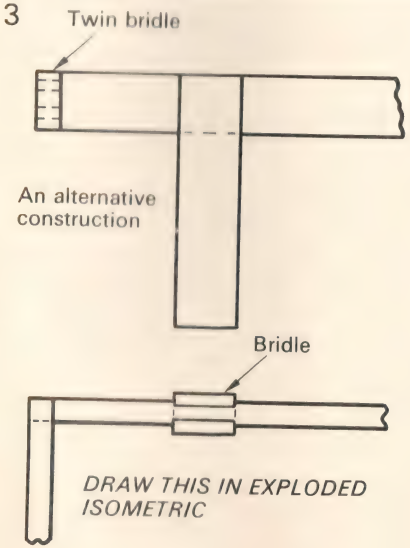


2

ONE METHOD OF STOOL-FRAME CONSTRUCTION



3



EXPLODED ISOMETRIC VIEWS ARE IDEAL FOR ILLUSTRATING FRAMED CONSTRUCTIONS IN WOODWORK. FIGURE 1, SHOWN HERE, IS MORE READILY UNDERSTOOD. COMPARE THE TWO

NOT TO SCALE

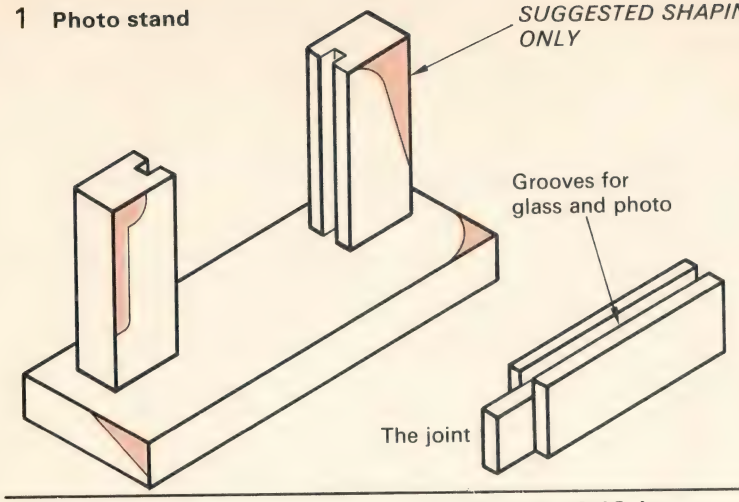
MORTISES AND TENONS

SHEET 78

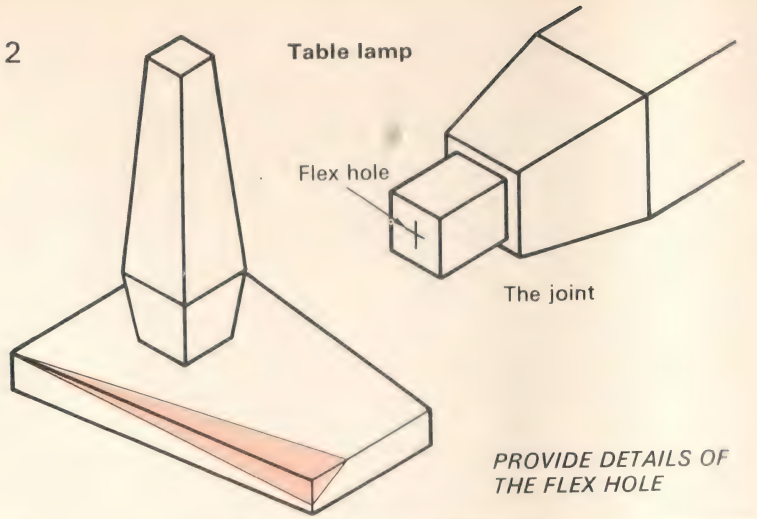
Exercises

1. Redraw the exploded isometric view of the frame construction in Fig. 2.
2. Draw an exploded isometric of the alternative construction in Fig. 3.

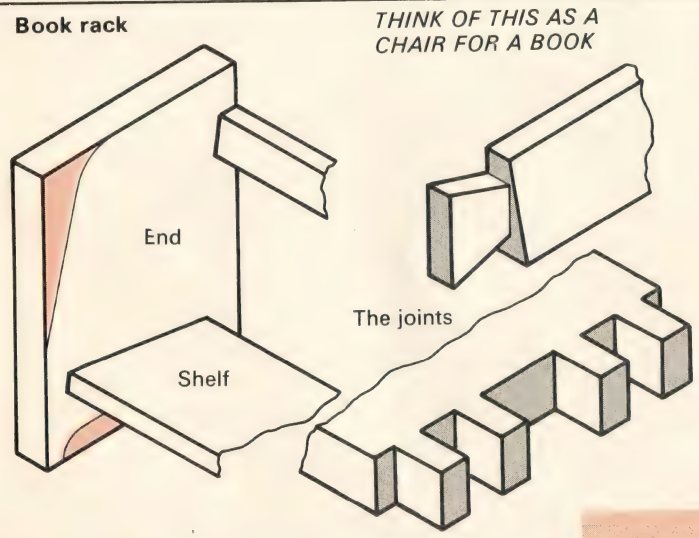
1 **Photo stand**



2 **Table lamp**

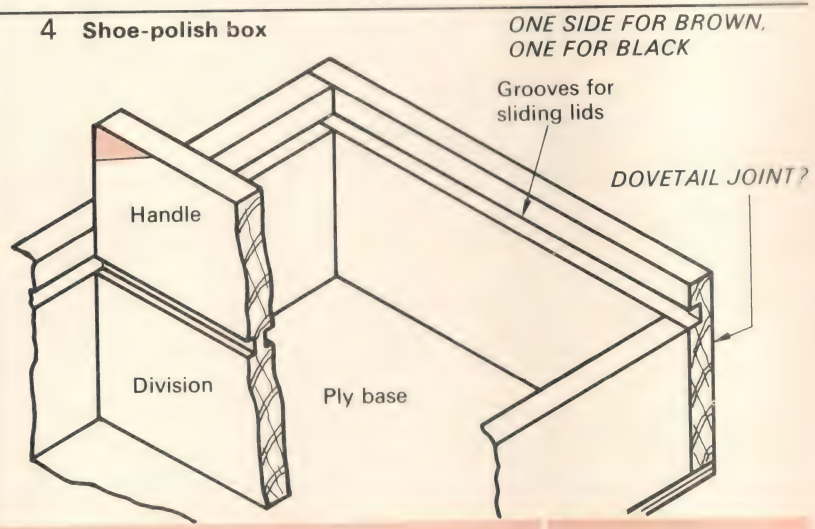


3 **Book rack**



NOT TO SCALE

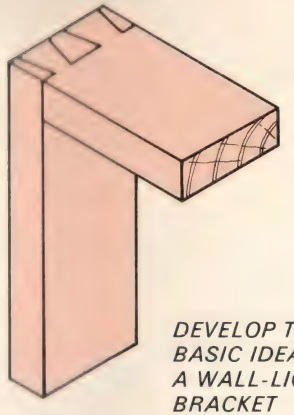
4 **Shoe-polish box**



BASIC IDEAS | SHEET 79

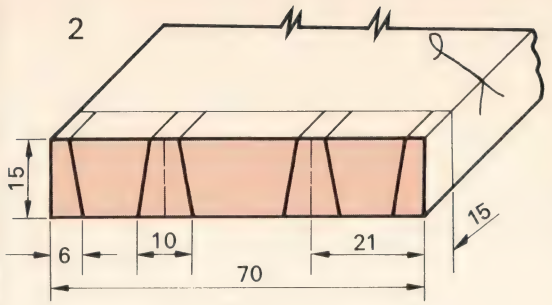
In a similar way to the basic ideas in metalwork, sufficient information has been given to enable you to improve and complete the designs for yourself.
Make full working drawings suitable for use in the woodwork shop.

1 **A bright idea**



DEVELOP THIS BASIC IDEA FOR A WALL-LIGHT BRACKET

2

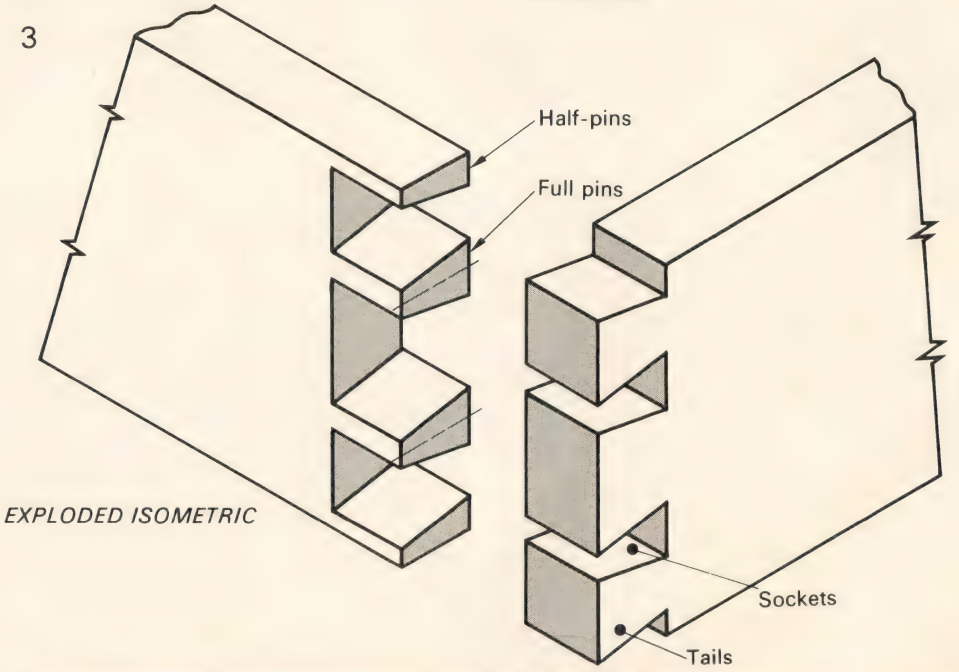


The use of cabinet oblique to show the marking-out for a through-dovetail joint
SLOPE OF PINS 1:6

FOR EXTRA STRENGTH AT THE EDGES PLACE THE INTERNAL PINS NEARER TO THE HALF-PINS

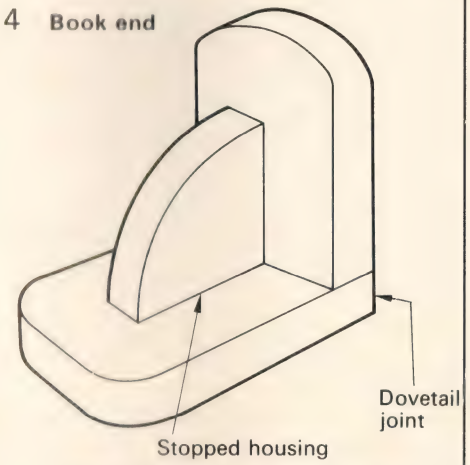
THE HALF-PINS SHOULD BE MORE THAN HALF, TO ALLOW FOR CLEANING UP THE EDGES

3



EXPLODED ISOMETRIC

4 **Book end**



WORKING DRAWINGS REQUIRED

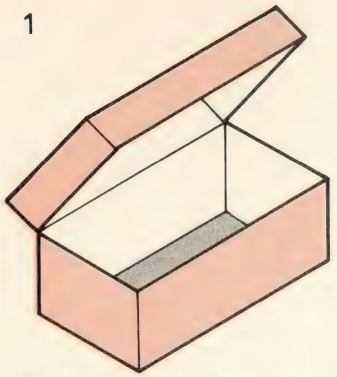
A DOVETAIL JOINT | SHEET 80

The slope of the pins on the exploded isometric must be plotted from their centre lines—the half-distances being transferred from the oblique view.

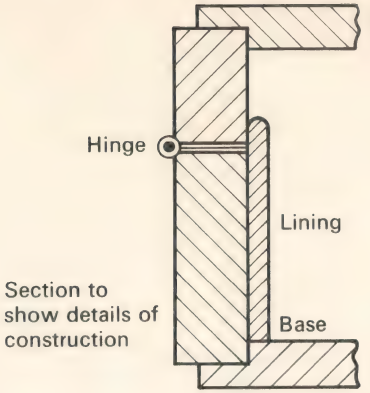
Exercises

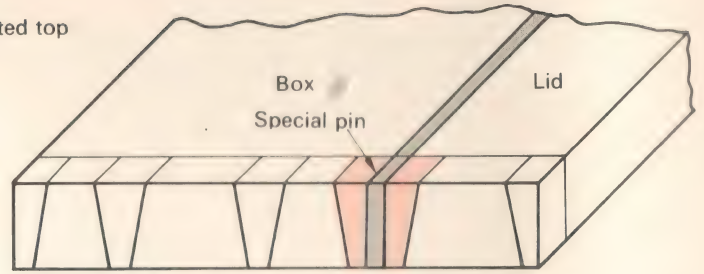
1. Redraw the dovetail in Figs. 2 and 3.
2. Develop and make drawings for the ideas in Figs. 1 and 4.

1



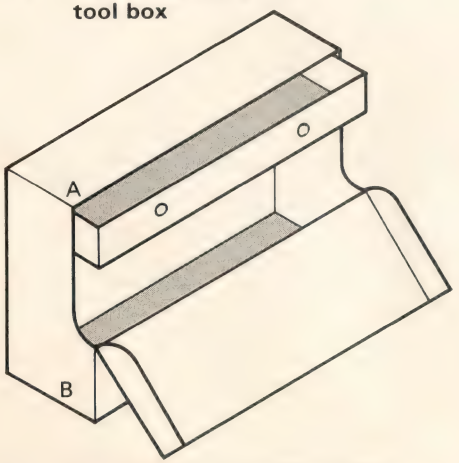
Basic idea for a small box with lid





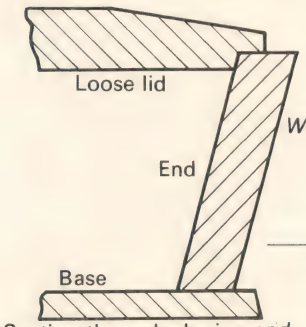
MARKING-OUT DETAILS OF THE DOVETAIL JOINT, SHOWING THE SEPARATION LINE BETWEEN LID AND BOX AND THE SPECIALLY WIDE DOVETAIL PIN

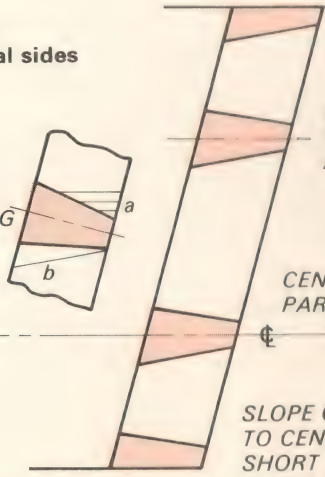
2 **Basic idea for a tool box**

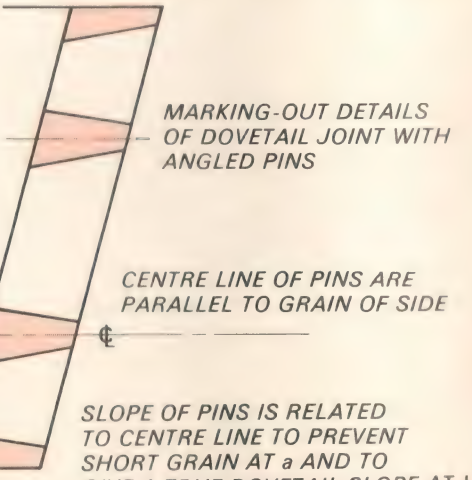


USE THE SPECIAL PIN DOVETAIL FOR THE JOINT AT A, BUT NOT AT B

3 **Basic idea for a jewel casket with sloping ends but vertical sides**







MARKING-OUT DETAILS OF DOVETAIL JOINT WITH ANGLED PINS

CENTRE LINE OF PINS ARE PARALLEL TO GRAIN OF SIDE

SLOPE OF PINS IS RELATED TO CENTRE LINE TO PREVENT SHORT GRAIN AT a AND TO GIVE A TRUE DOVETAIL SLOPE AT b

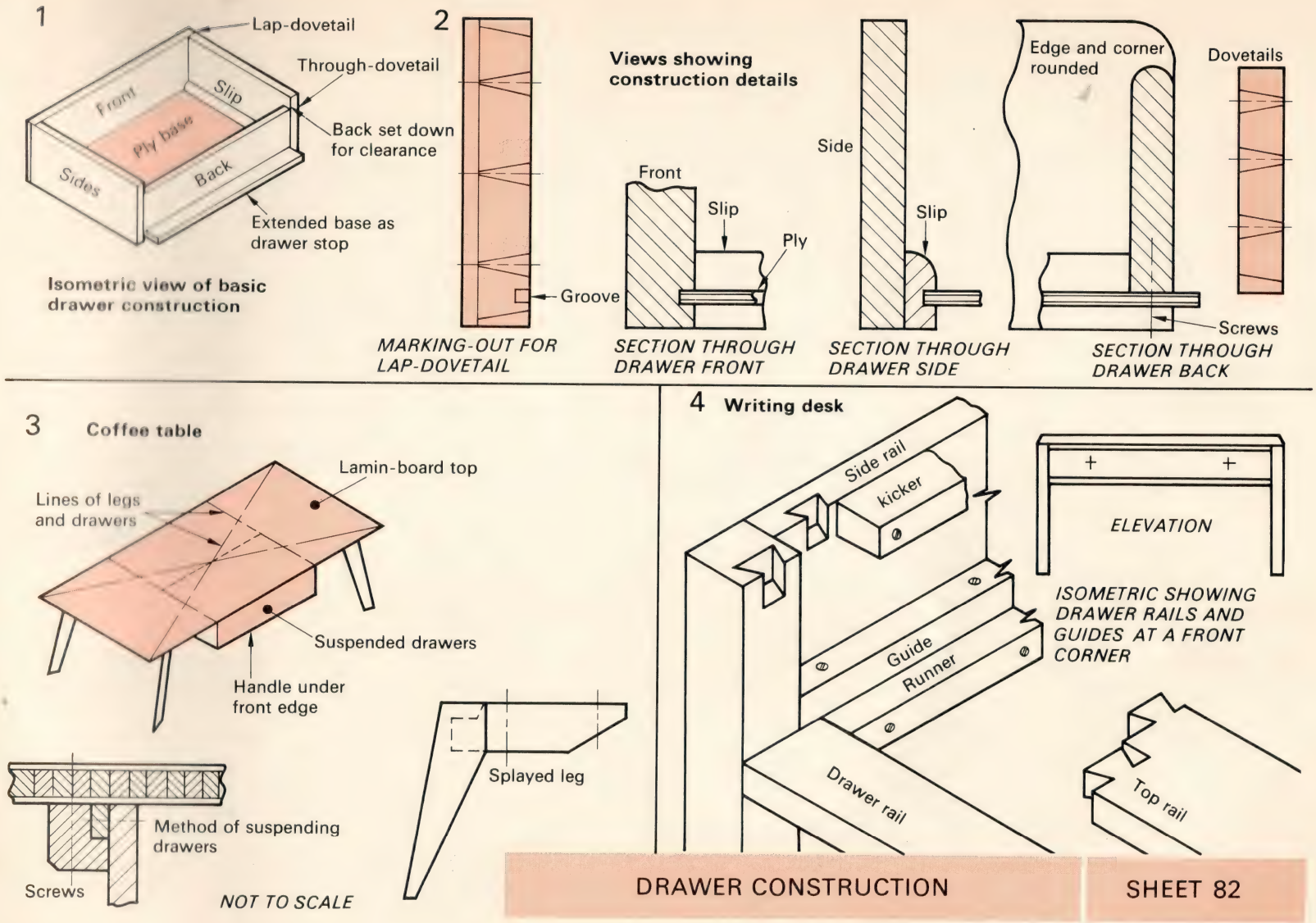
NOT TO SCALE

BOXES SHEET 81

The drawings show two special examples of dovetail joints and their application.

Exercises

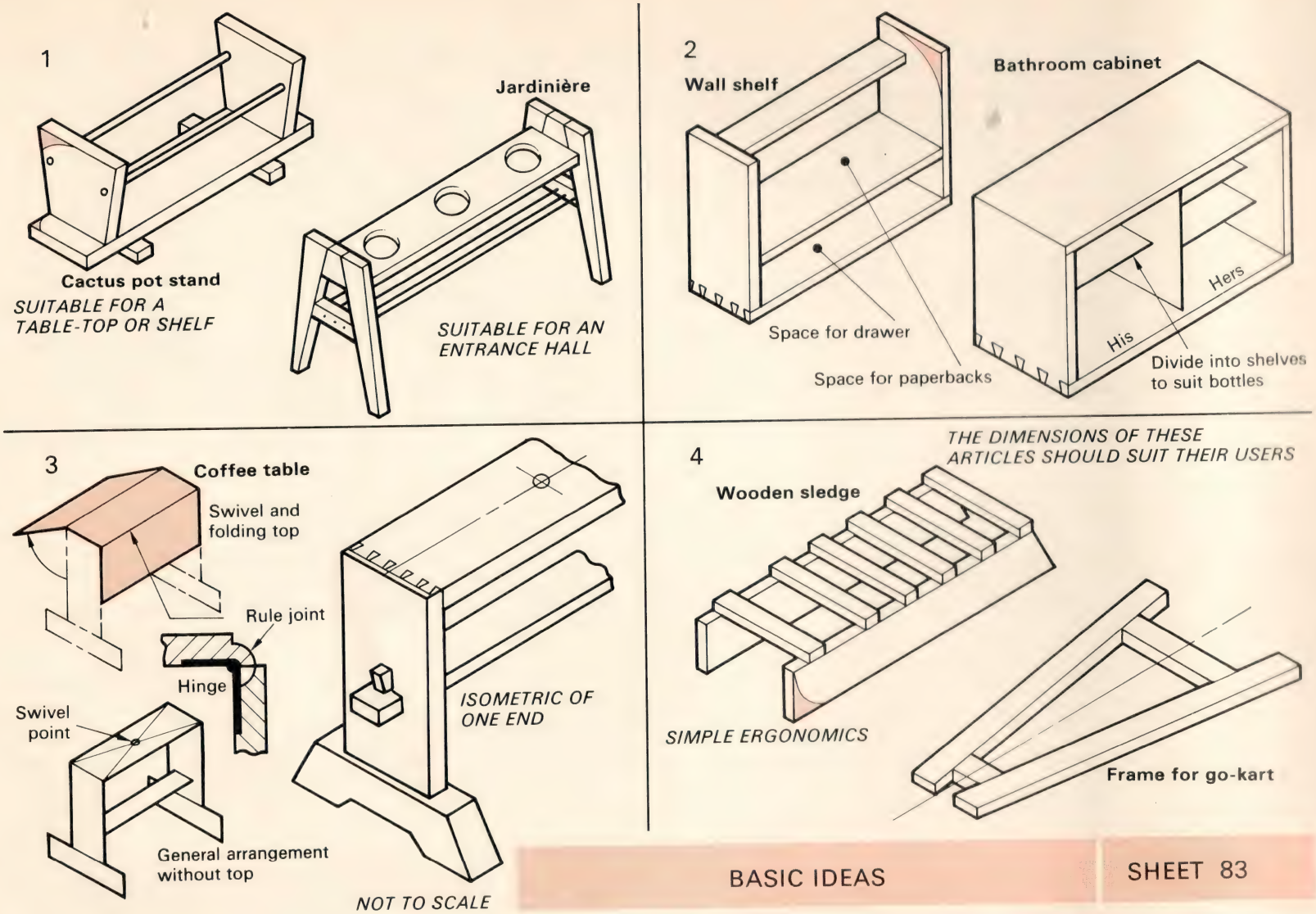
1. Use the details supplied in an idea for a small box of your own design.
2. Make working drawings for the tool box in Fig. 2. The inside of the lid has to be long enough to accommodate a panel saw. Include details to show how the saw is held in place.
3. Make working drawings of the jewel casket. Design a handle for the lid.



The figures show a general view of drawer construction, and a series of detail sections.

Exercises

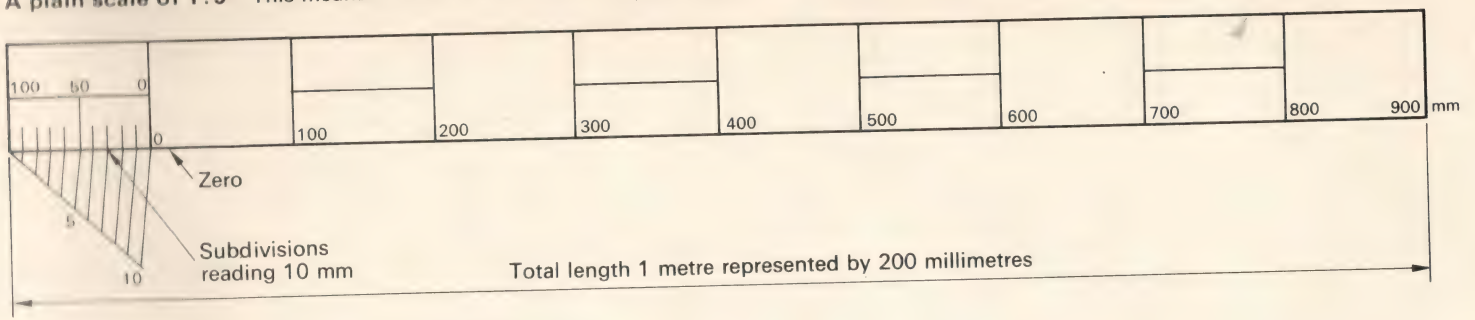
1. Design a coffee table similar to the one shown in Fig. 3.
2. Illustrate the corner joints in Fig. 4 in orthographic projection, taking sections to make the arrangement quite clear. Consult specialist textbooks as necessary.
3. What advantages are there in using drawer slips? Are slips really necessary for suspended drawers?
4. Make an exploded isometric view of a drawer lap-dovetail.



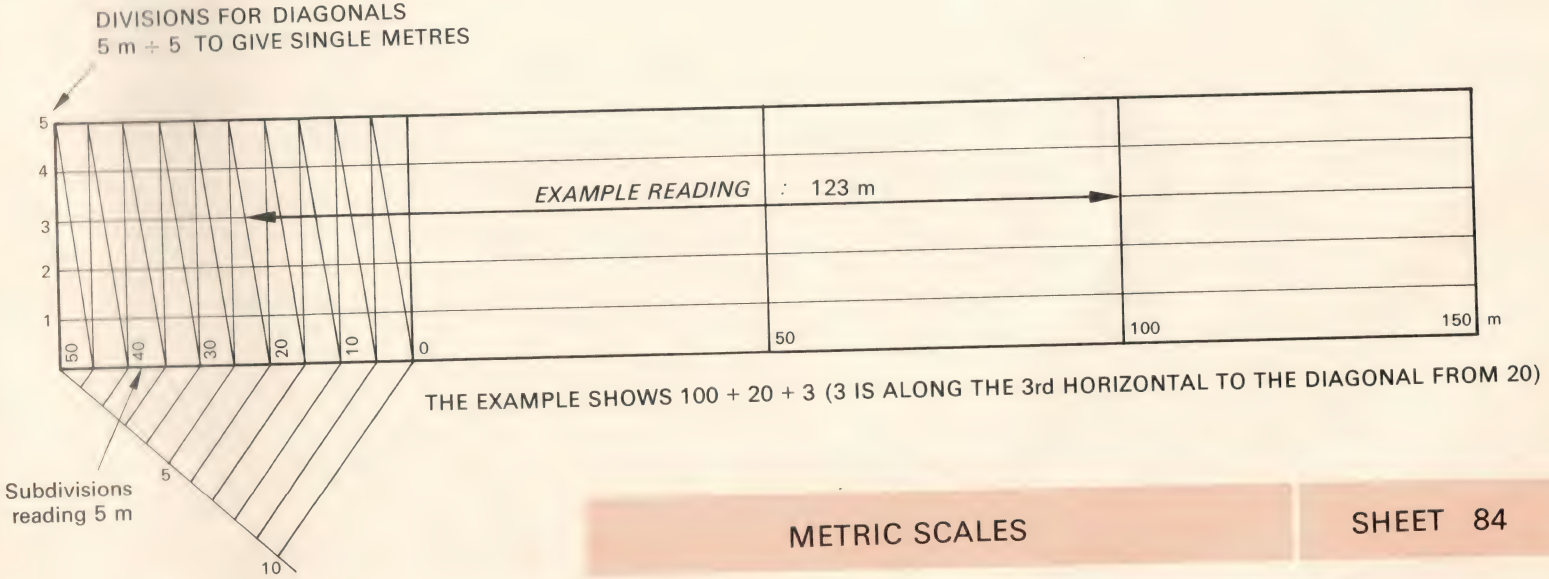
BASIC IDEAS | SHEET 83

Make working drawings for one or more of the examples. Add improvements and shaping as necessary.
Design a swivel mechanism for the table in Fig. 3.

1 **A plain scale of 1:5** This means that one-fifth of a metre represents 1 metre $\therefore \frac{1\text{ m}}{5} = \frac{1000\text{ mm}}{5} = 200$ mm to 1 m



2 **A diagonal scale of 1:1000** Reading up to 200 m in 50 m intervals, in 5 m subdivisions, and diagonally to 1 m = 1 mm to 1 m



METRIC SCALES SHEET 84

The recommended scales are obtained by applying the scale multipliers or dividers of 2, 5, and 10.

The increasing scale ratios produced are therefore in the order of 2:1, 5:1, and 10:1.

The reciprocal decreasing ratios are: 1:2; 1:5; and 1:10.

All ratios can be reduced or increased as required. Intermediate ratios—e.g., 1:25, one twenty-fifth—could be taken when considered to be essential.

Figure 1 shows a scale of 1:5, together with the simple arithmetic necessary to give 1:5 in terms of millimetres to metres. Notice how the first interval of all scales is subdivided for the smaller units; and the position of the zero datum point. The intervals increase towards the right, while the subdivisions increase towards the left.

Figure 2 shows a diagonal scale, which is really an extension of a plain scale.

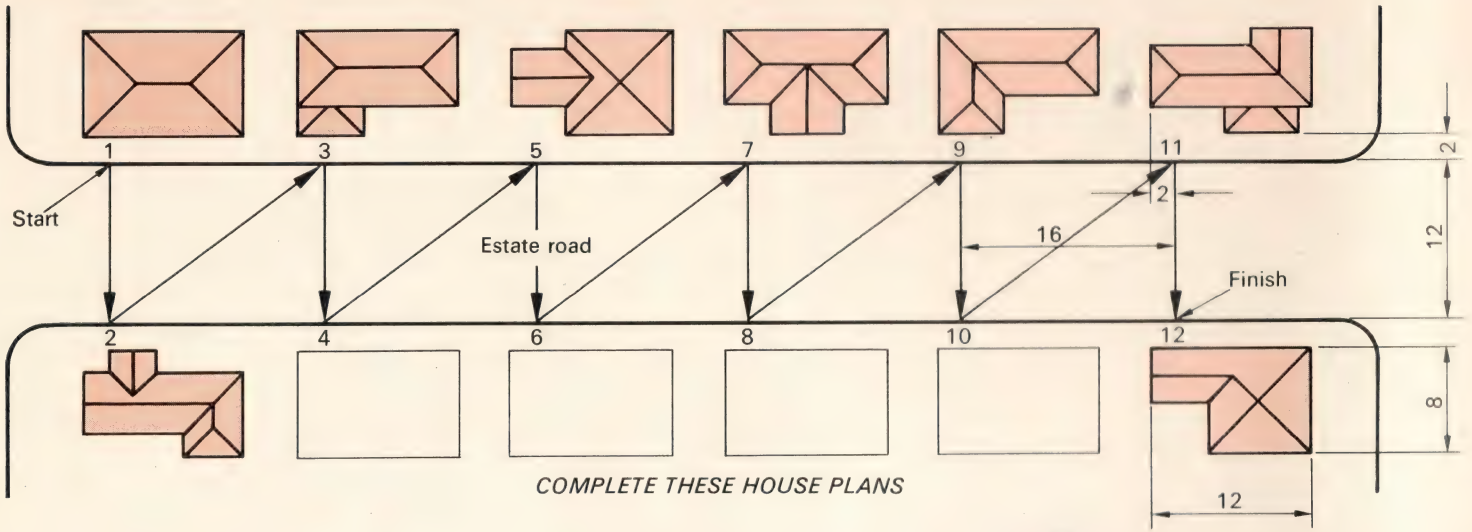
The subdivisions at the beginning may be further divided by a vertical scale at the end, as shown.

The plain-scale subdivisions form narrow rectangles, the diagonals of which produce the finer readings of a diagonal scale. As each diagonal moves upwards from its base, it moves also to the left through one subdivision unit. The horizontal lines register the proportional increase.

Exercises

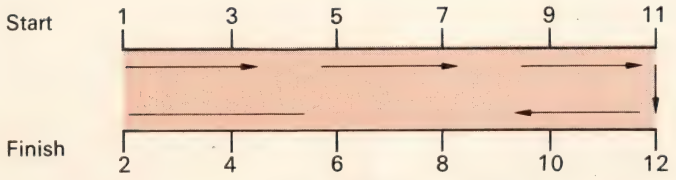
1. Make accurate drawings, with notes, of the given scales.
2. Draw a diagonal scale of 1:20 000, to read up to 3 kilometres at 1 km intervals, to 0·1 km and 0·01 km.

1



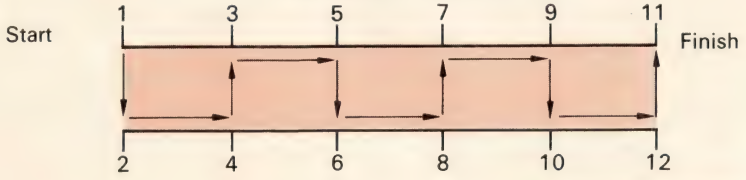
COMPLETE THESE HOUSE PLANS

2



TWO OTHER ROUTES

3



Answer chart

TOTAL LENGTHS OF DELIVERY ROUTES

1 ____ METRES

2 ____ METRES

3 ____ METRES

DIMENSIONS IN METRES

ROUTES

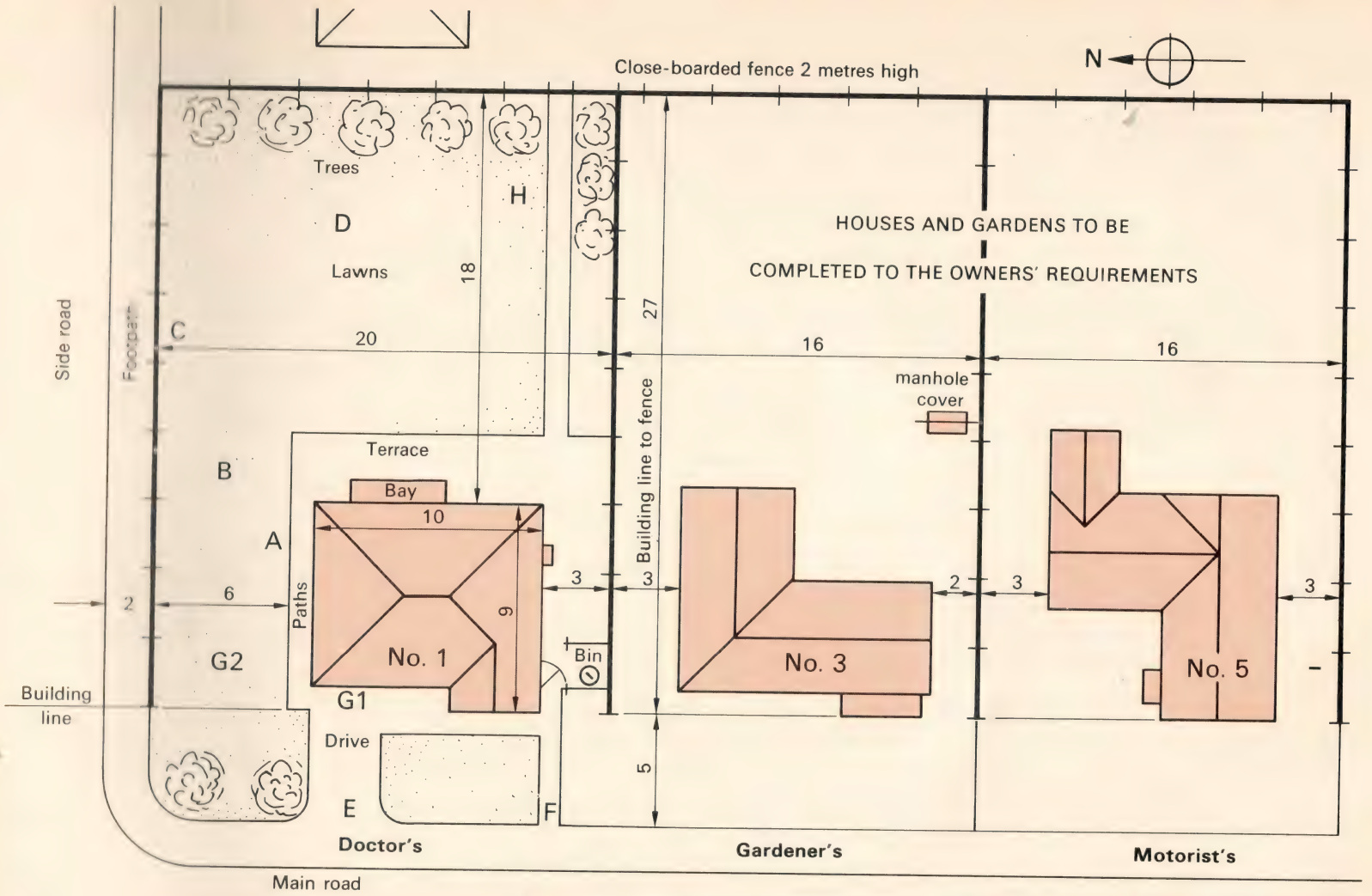
SHEET 85

The drawings show three alternative routes a postman or delivery-man might take if deliveries were to be made at all the houses in the road. It is an exercise involving the use of scales, simple arithmetic, and aspects of the environment.

The main drawing shows the road complete with several houses. Each house fits into a rectangle of 12 m × 8 m.

Exercises

1. Set out the road and complete the house plans to a scale of 1 : 400.
2. On this same drawing follow the routes indicated by the arrows in Fig. 1, and in the diagrams at Figs. 2 and 3.
   Do you think that route 1 is longer than route 3?
   Calculate the route lengths from start to finish in each case.



DIMENSIONS IN METRES

HOMES AND GARDENS

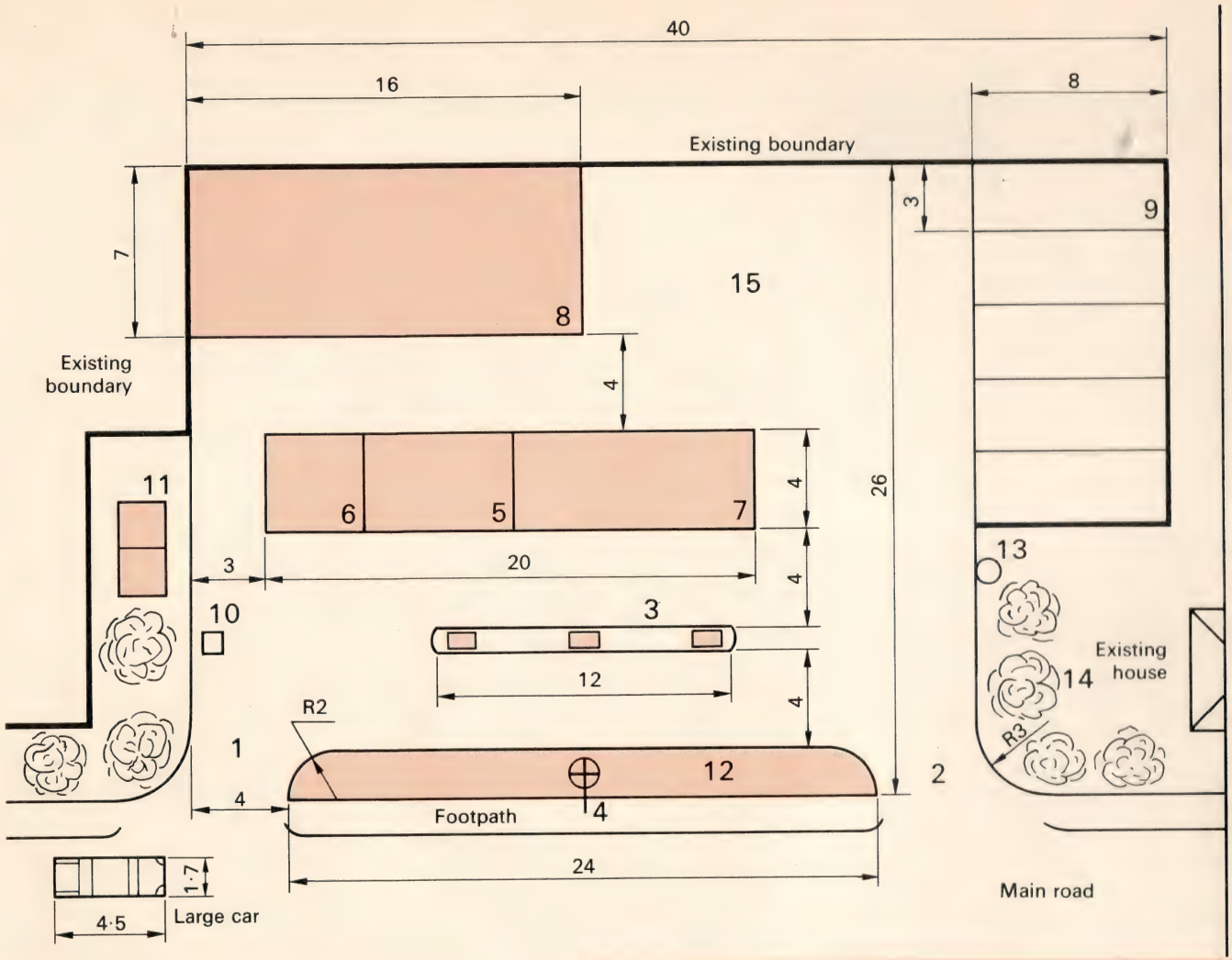
SHEET 86

The drawings show three plans of houses on a modern estate. Their owners—a doctor; a gardener; and a motorist—wish to develop their homes and gardens in special ways. The doctor, who needs an extension for a surgery, requires, at or near the places indicated, the following: A, entrance to consulting room; B, consulting room, waiting room, office, toilets, and pram port; C, patients' entrance; D, secluded garden; E to F, curved drive; G2, second garage; H, home workshop.

Exercises

1. Draw the homes and garden to scale of 1:100 on A2 paper.
2. Discuss and plan the doctor's requirements in detail, and add these to the drawing.
3. Discuss the possible requirements of the gardener and the motorist. Make a list of the features which seem suitable to you and plan their location on the drawing.

Note: In all cases you must provide written evidence of the points raised in your discussion. The buildings must show some internal detail, as suggested on Sheet 90.



Requirements

1. Entrance
2. Exit
3. Pumps
4. Sign
5. Sales
6. Office
7. Light service
8. Repair shop
9. Lock-ups
10. Two-stroke
11. Toilets
12. Flower beds
13. Free air
14. Trees
15. Open yard

DIMENSIONS IN METRES SUPPLY DETAILS NOT GIVEN

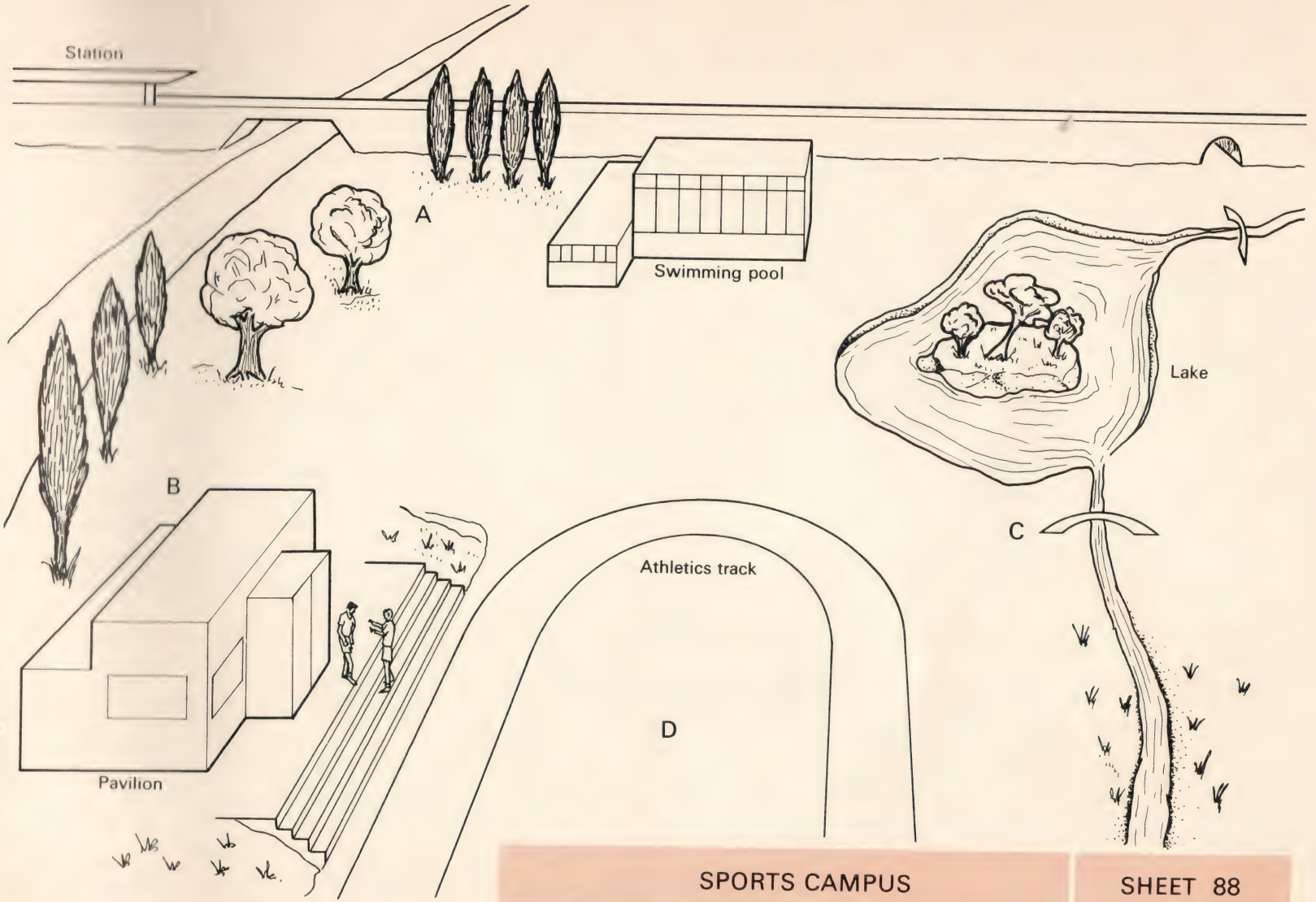
SERVICE STATION

SHEET 87

In planning environmental features, you are often limited by the size and shape of the available space and have to provide or limit facilities accordingly.

Exercises

1. Hold a class–teacher discussion on service stations and garages in general. Draw up a list of what you think the essential provisions are.
2. To a scale of 1:100, draw the given boundary and plan the positions of the buildings. Take the given dimensions only as a guide. Make card shapes of the buildings to facilitate planning and repositioning. Use car-size templates to check for access and circulation.
   Would it be a good idea to illustrate your work by glueing on coloured cards?
   Remember to make the station attractive with trees and flowers.



SPORTS CAMPUS SHEET 88

The drawing shows how a large area of parkland may be planned and developed for pleasure and sporting facilities.

Exercises

1. To the left-hand side of a sheet of A2 drawing paper, draw your interpretation of the plan of the given area—and add, as a continuation on the right-hand side, the remainder of the campus sports facilities and landscaping which comprise:

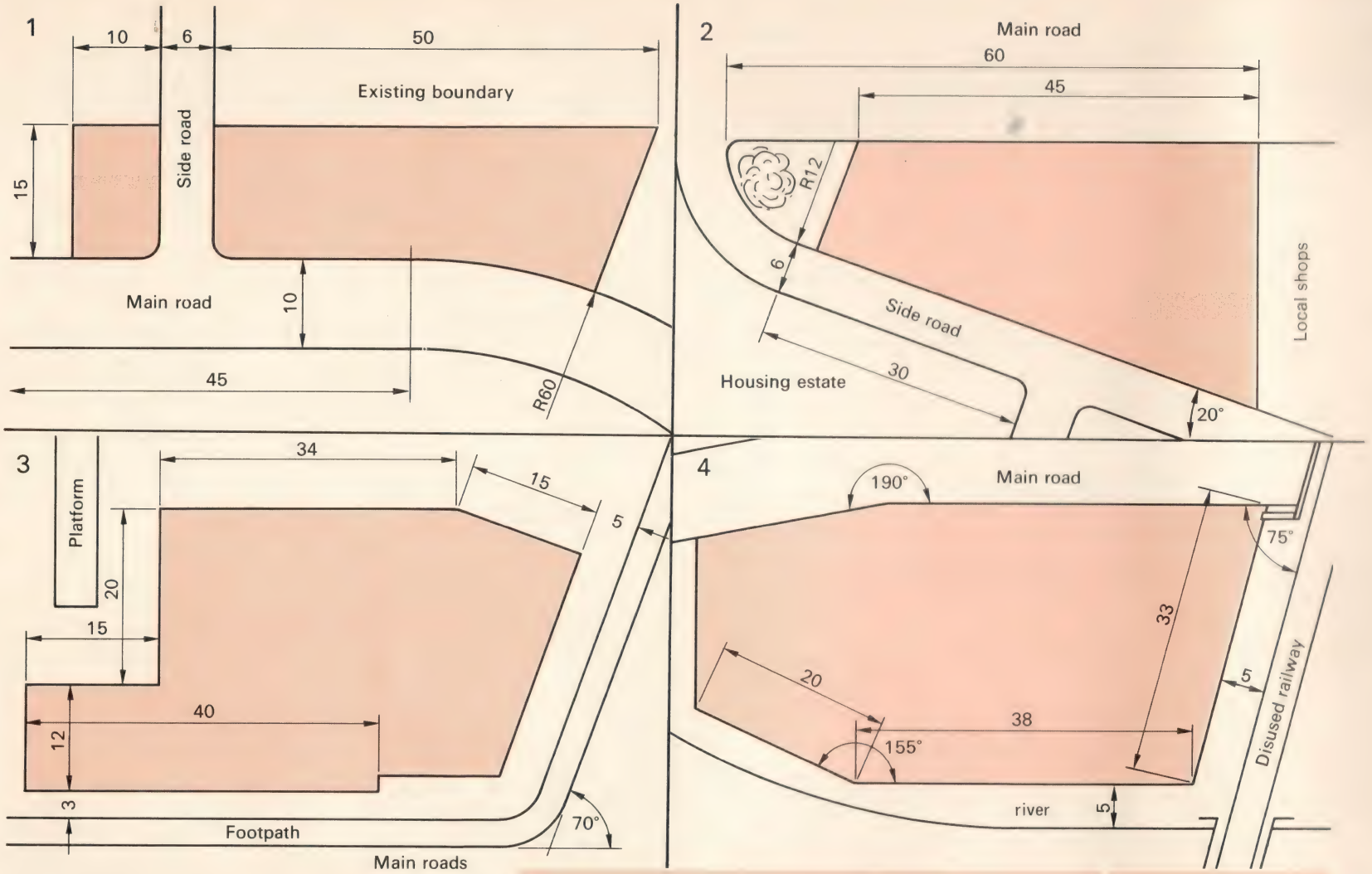
tennis courts; miniature golf course; and a café.

The landscaping is to include footpaths, flower beds, and trees.

Provide the following at these points:

A swimming pool and railway-station car park;
B coach and car park for visiting athletic teams;
C a footbridge;
D field-event areas.

Draw the plan to a large scale so as to fill the whole A2 paper. Plan the footpaths to provide varied, convenient, and interesting walks.



DIMENSIONS IN METRES SUPPLY DETAILS NOT GIVEN

DEVELOPMENT SITES

SHEET 89

The four, separated drawings represent vacant sites which are to be developed.

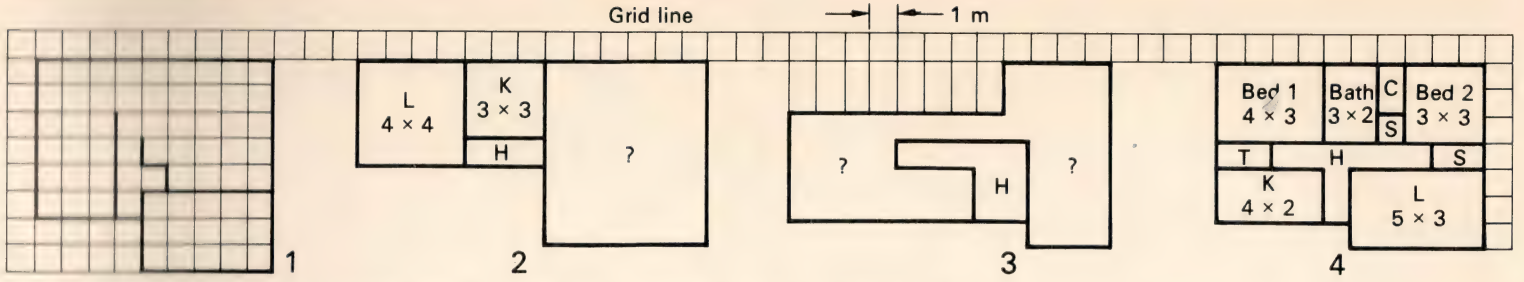
Exercises

1. To a larger scale, draw the site boundaries and plan the arrangement of the sites for the following:

Fig. 1 car sales and light service only;
Fig. 2 car parking for shoppers and a main-road bus pull-in;
Fig. 3 railway-station entrance and offices, taxi rank and minor services; and
Fig. 4 *one* of the following: transport café, long-distance coach station, marina and services, swimming pool, or medical clinic with children's park.

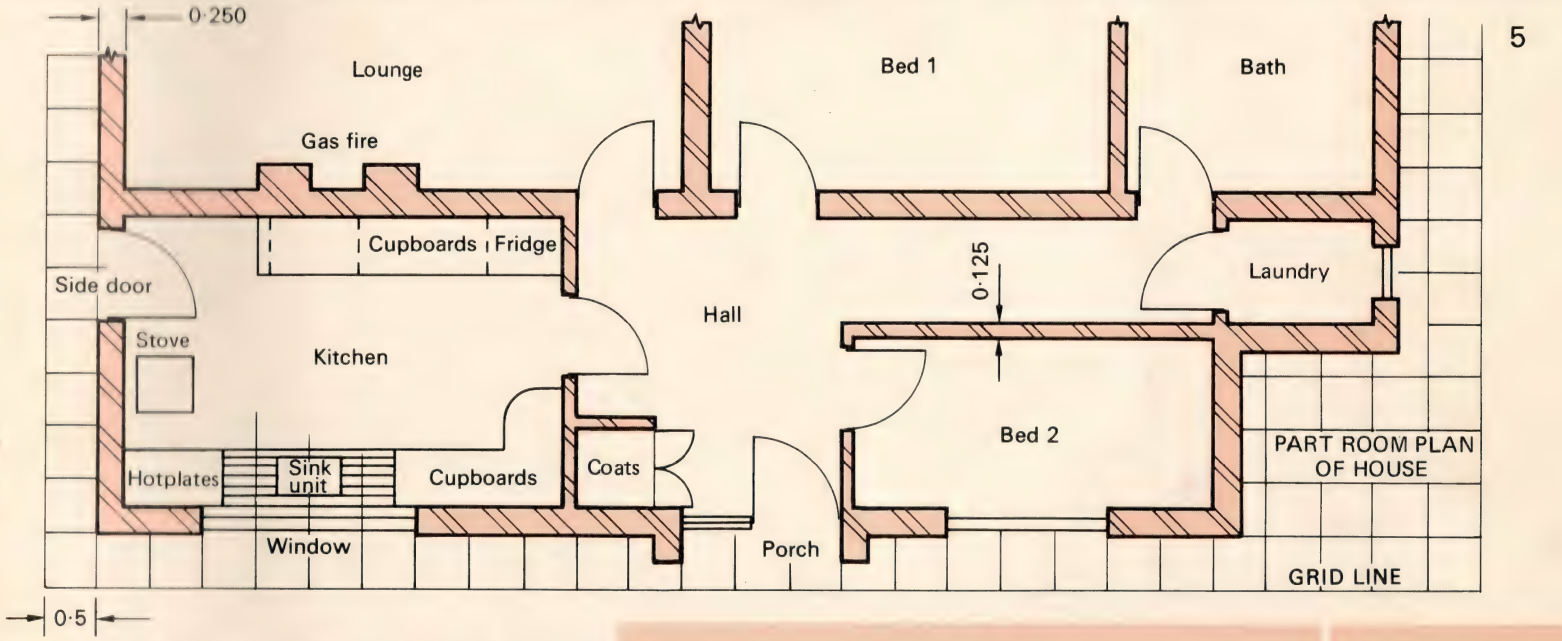
2. If practicable, set out a site full-size on the playground. Use it to learn to appreciate distances and areas, and to experiment with positioning buildings and keeping pathways for the circulation of people and cars.

3. Set out a site to a large scale on a sheet of plywood. Make card templates for buildings and vehicles. Adopt the best solution, and design and make model buildings to the same scale in the drawing office and woodwork room.



DEVELOPMENT SERIES OF HOUSE ROOM PLANS DRAWN OVER GRID MODULE OF 1 m^2

KEY TO ROOMS: L, lounge; K, kitchen; H, hall; T, toilet; C, cupboard; L, Laundry; ?, to be planned



DIMENSIONS IN METRES

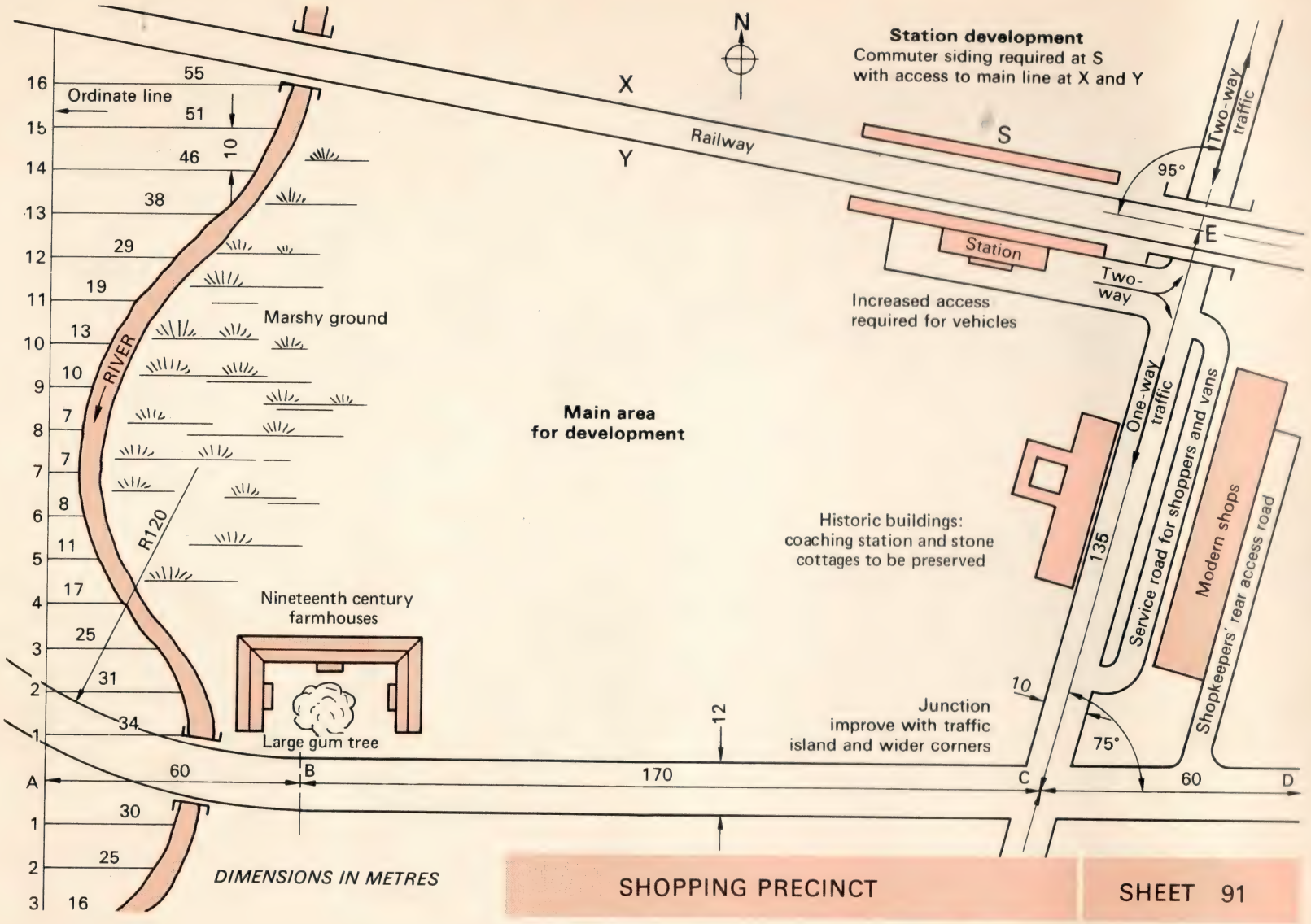
ROOM PLANS

SHEET 90

Room and house plans are a part of the environment of great concern to us all. There must be enough area for functional purposes which must be used economically. Figures 1 to 4 have been drawn over a grid, each square of which represents a metre square. This is a useful scale for planning a general layout in a development series. Figure 1 shows how the lines of the grid are used; while Fig. 4 shows a completed diagrammatic plan.

Exercises

1. Using 5 mm squared grid paper, draw and complete Figs. 1 to 4.
2. Taking Fig. 5 as an example, make a large, completed drawing of a bungalow room plan of your own design.
3. Discuss the requirements for a room plan for a block of flatlets for an old people's home. Select and develop the ideas you wish to include and draw up a suitable grid plan.
4. Discuss, develop, and draw the requirements for one of the following: youth centre; swimming pools; garage repair shops; medical clinic; airport terminal.

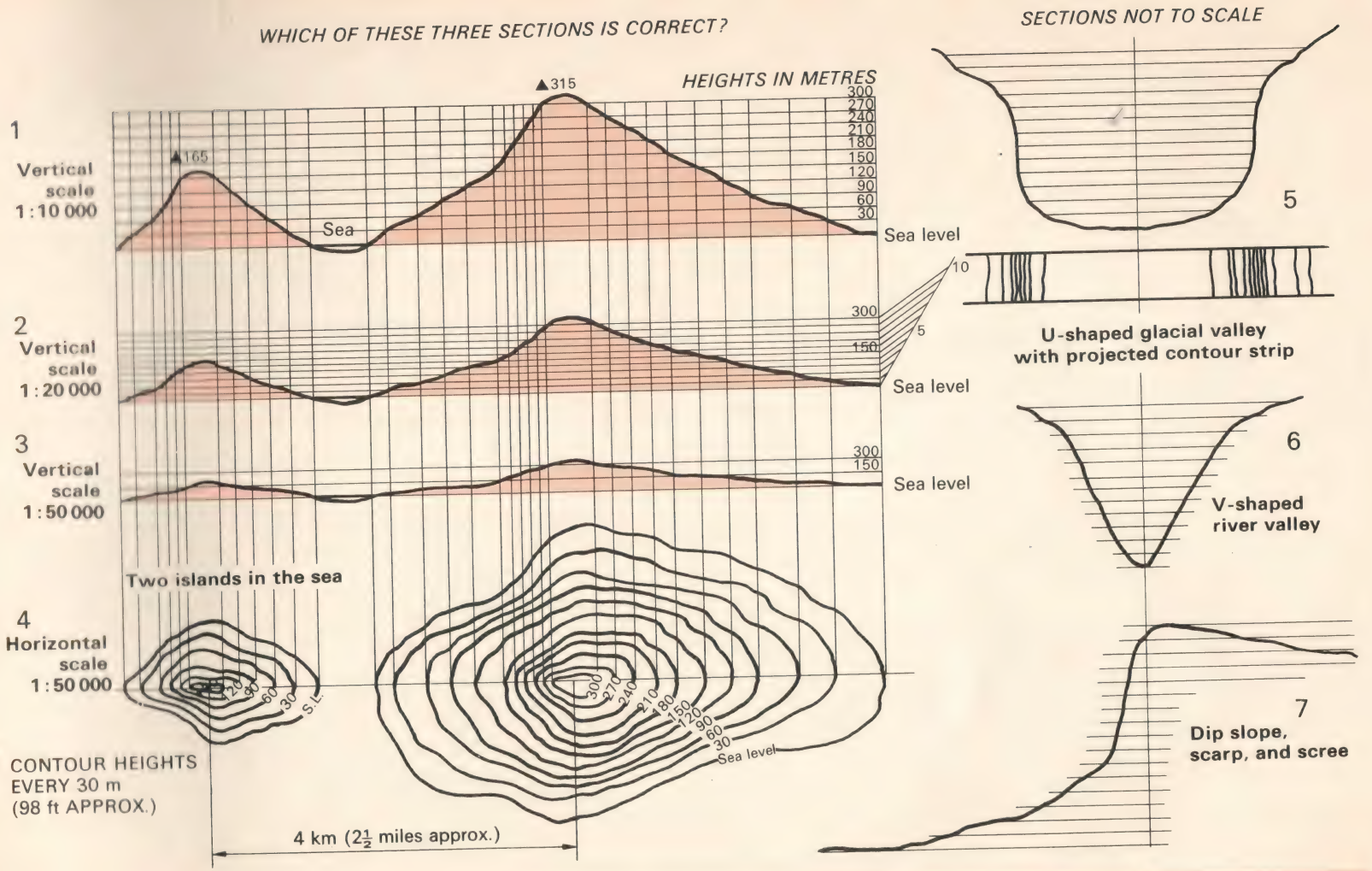


The simplified map shows an area of a small town which is to be redeveloped. The old buildings subject to a demolition order have been removed and a modern traffic-free shopping precinct is to be developed in their place up to the riverside.

The coaching station and farmhouses are to be retained and incorporated attractively into the new developments in such a way as to preserve their historic character and charm.

Exercises

1. Discuss the existing site plan and the special physical and social requirements of its outstanding features. Make a folder of notes and sketches of the points raised, and especially of the ideas you wish to see applied.
2. To a scale of 1:500 on A2 paper, draw the site plan as given, supplying all minor sizes and details.
3. Over your drawing fix a sheet of tracing paper and draw on this your proposed, or experimental, redevelopment scheme. When this is satisfactory, draw the final scheme on the drawing paper. Use colour-wash, coloured card or crayon, transfer lettering, and technical pens, to produce a professional finish.



CONTOURS SHEET 92

Contours show equally progressive heights above sea level. All points on a contour line are at the same height.

The plans of the two islands in the drawing show contours spaced vertically every thirty metres. The islands have been drawn to a horizontal scale of 1 : 50 000. The centre distance of the heights is given as 4 km, which is approximately $2\frac{1}{2}$ miles.

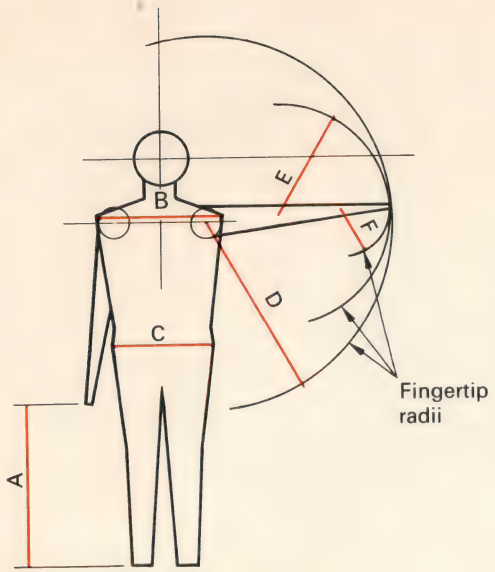
Three elevations of the islands have been given, and it should be quite clear how the outline and shape alters with the vertical scales, which are: 1 : 10 000, 1 : 20 000, and 1 : 50 000. The elevations in Figs. 1 and 2 cannot show the true shape of the islands, because their vertical scales are not the same as the horizontal scale of the plan. Figure 3 shows the true profile along the plan centre line.

Exercises

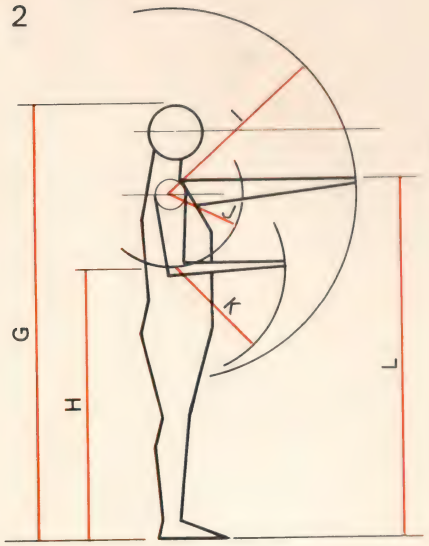
1. Draw two islands similar to those given in Fig. 4, and project three elevations to the given scales.
   It is sometimes necessary to increase the vertical scale in order to emphasize geological structure.
2. Draw diagrams similar to those in Figs. 5, 6, and 7, obtaining for each its projected contour strip.
3. From magazines, newspapers, etc., cut out sections and plans illustrating geophysical features and make up a scrapbook of them.
   Look out for those which illustrate some aspect of the following:

   Natural gas; coal mining; oil wells; geological strata; faults and unconformities; diamond mines; volcanoes; potholes and caves; artesian water; continental shelf; atoll formation; raised beach; sea cliff; hanging valley.

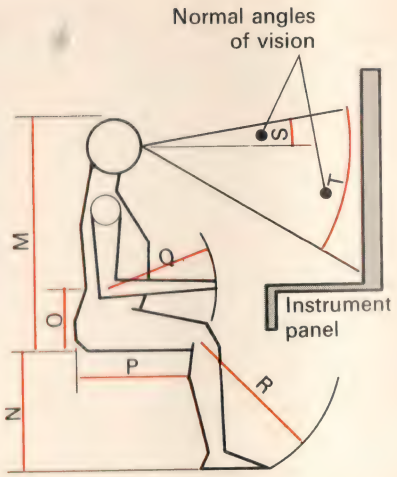
1



2



3



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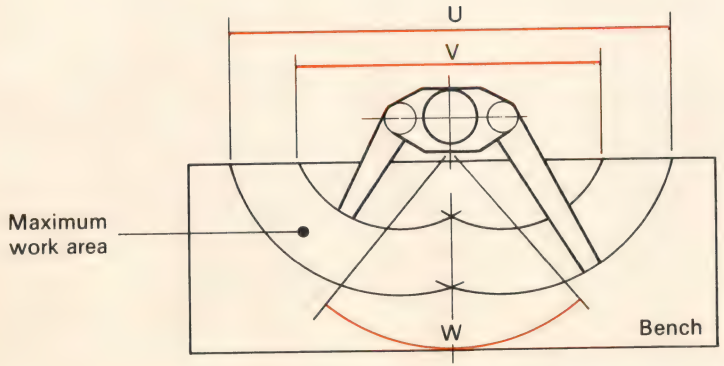


Human dimensions for application in work and leisure situations

ANTHROPOMETRICS SHEET 93

Anthropometrics is concerned with the measurements of the human body. A factor such as total body height is but one of many which include elbow height, knee height, and the reach of the arms. It is an important preliminary study to ergonomics—the study of man in relationship to all forms of working situations.

The diagrammatic figures (Figs. 1 to 4), show the human body in various work attitudes, and drawn in elevation and plan views. Clearly indicated are the radii of the limbs, relevant heights, and normal angles of vision. These are important considerations when designing machinery which man has to operate efficiently and safely; or in planning the layout of a work bench, or a panel of instruments which has to be constantly monitored.

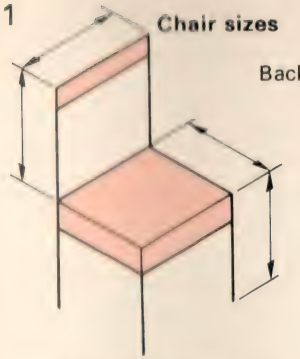
Exercises

1. Compile a table giving the following information for all the dimensions or angles indicated on the sheet in colour: dimension key; maximum dimension; minimum dimension; average dimension.

   Start your work by selecting ten boys of varying stature from your class, and take measurements from them. Remember that your table of statistics will apply only to adolescents.

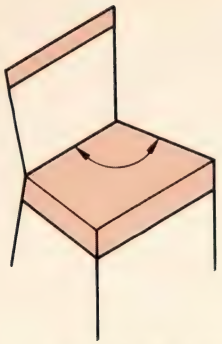
2. Design your own diagrammatic man and apply to him the average dimensions you have obtained.

1 **Chair sizes**



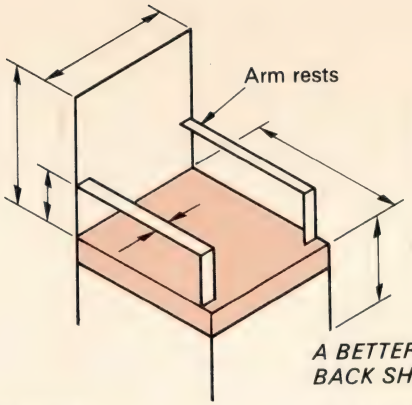
THESE DIMENSIONS AND ANGLES ARE IMPORTANT WHEN MAKING A CHAIR FRAME TO FIT THE HUMAN FORM

Back support



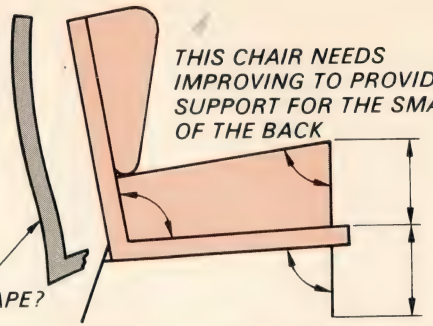
NOTE HOW ANGLED SIDES GIVE A BETTER APPEARANCE AND PERHAPS GREATER COMFORT

Arm rests



A BETTER BACK SHAPE?

THIS CHAIR NEEDS IMPROVING TO PROVIDE SUPPORT FOR THE SMALL OF THE BACK

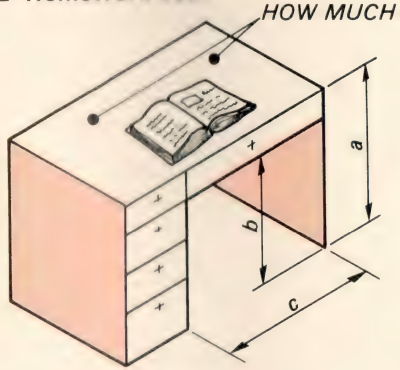


AN EASY CHAIR IS LOWER AND LARGER THAN A DINING CHAIR. SLOPING SEAT, BACK, AND ARMS ADD TO COMFORT. SOLID SIDES AND WINGS

OTHER EXAMPLES

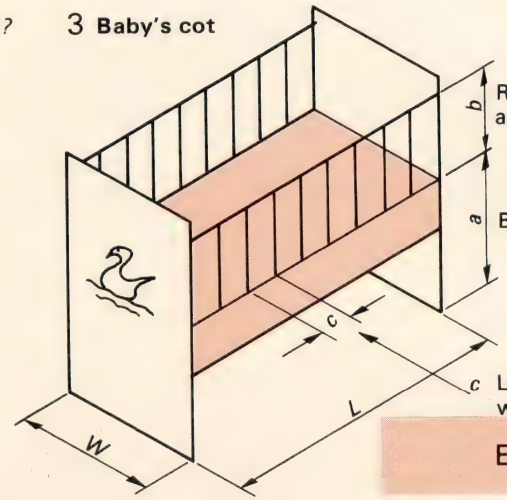
2 **Homework desk**

HOW MUCH AREA?



a Writing height
b Knee room
c Leg room

3 **Baby's cot**



b Rail height above bed

a Bed height

c Less than body width

4 **The house that Jack built**

HOW MANY MISTAKES ARE THERE?

ERGONOMICS (1) SHEET 94

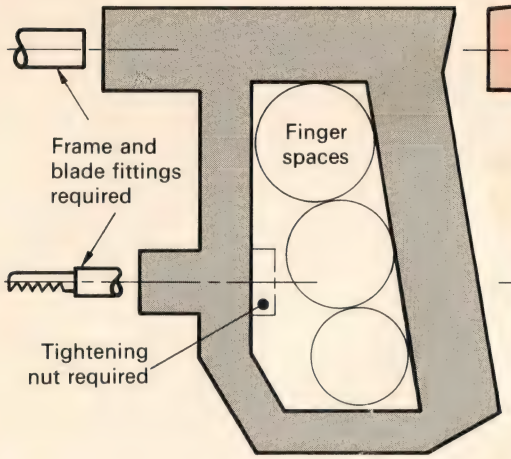
You are engaged in a form of ergonomic planning when you heighten or lower your bicycle seat or handle bars. It is really a case of making the sizes and position of features suitable for those who have to use them, as in the sledge and go-kart problems on Sheet 83. For spacecraft, for example, this can be quite complicated.

The diagrams in Fig. 1 show how chair sizes, areas, and angles should be determined by the human form. You may never be called upon to design a chair, but you should have an understanding of some of the governing factors.

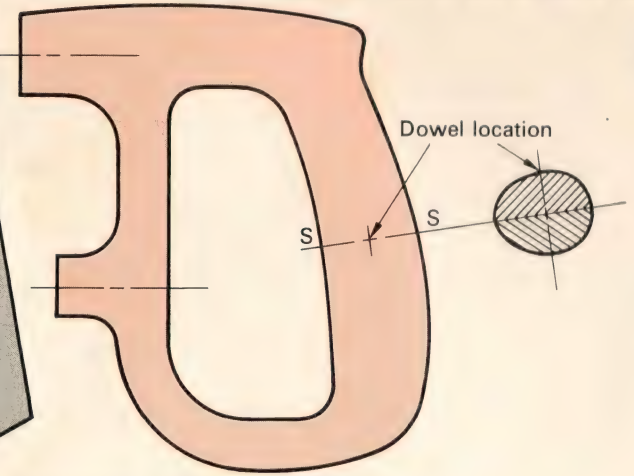
Exercises

1. After some research and experimentation, decide on the dimensions and angles indicated but not given. The seat height of a dining chair usually has been taken (for adults) to be eighteen inches in Imperial measure. Does it matter to the nearest ten, twenty, fifty, or a hundred millimetres? Could you plan an easy chair to suit everybody?
2. Using the dimensions you have obtained, redraw to a suitable scale the series of chair diagrams.
3. Determine the sizes for the furniture in Figs. 2 and 3 and redraw to scale orthographically. Assume that the desk is for a growing child.
4. Redesign the entrance hall to Jack's house, but retain the items shown.
5. Collect and illustrate in chart form magazine photographs showing examples in ergonomics.

1 **Cast handle for small hacksaw**



2 **The same handle made a comfortable, easy-to-grip shape, pleasant to look at and suitable for a split pattern**



COMPLETE THIS END ELEVATION WITH SMOOTH CURVES

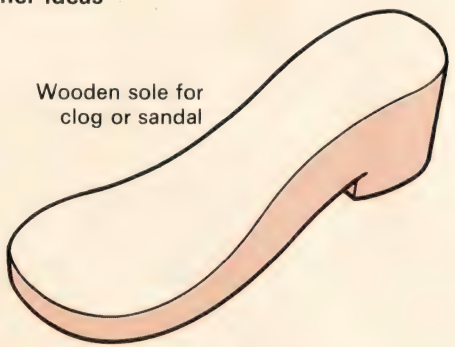
TAKE SECTIONS AT IMPORTANT POINTS AROUND THE MAIN ELEVATION, AS AT SS

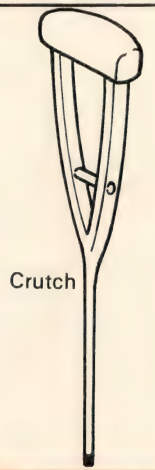
SHOW DOWEL LOCATIONS FOR THE TWO HALVES

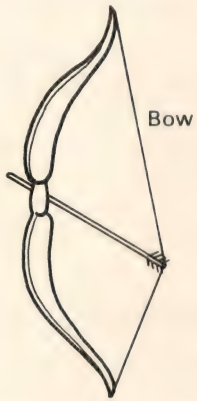
MUST THE DOWELS BE LOOSE, GLUED, OR TAPERED?

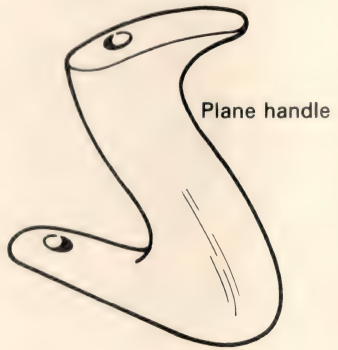
FIRST OBTAIN BASIC AND ESSENTIAL DIMENSIONS, THEN ADD SHAPE

3 **Other ideas**









NOT TO SCALE

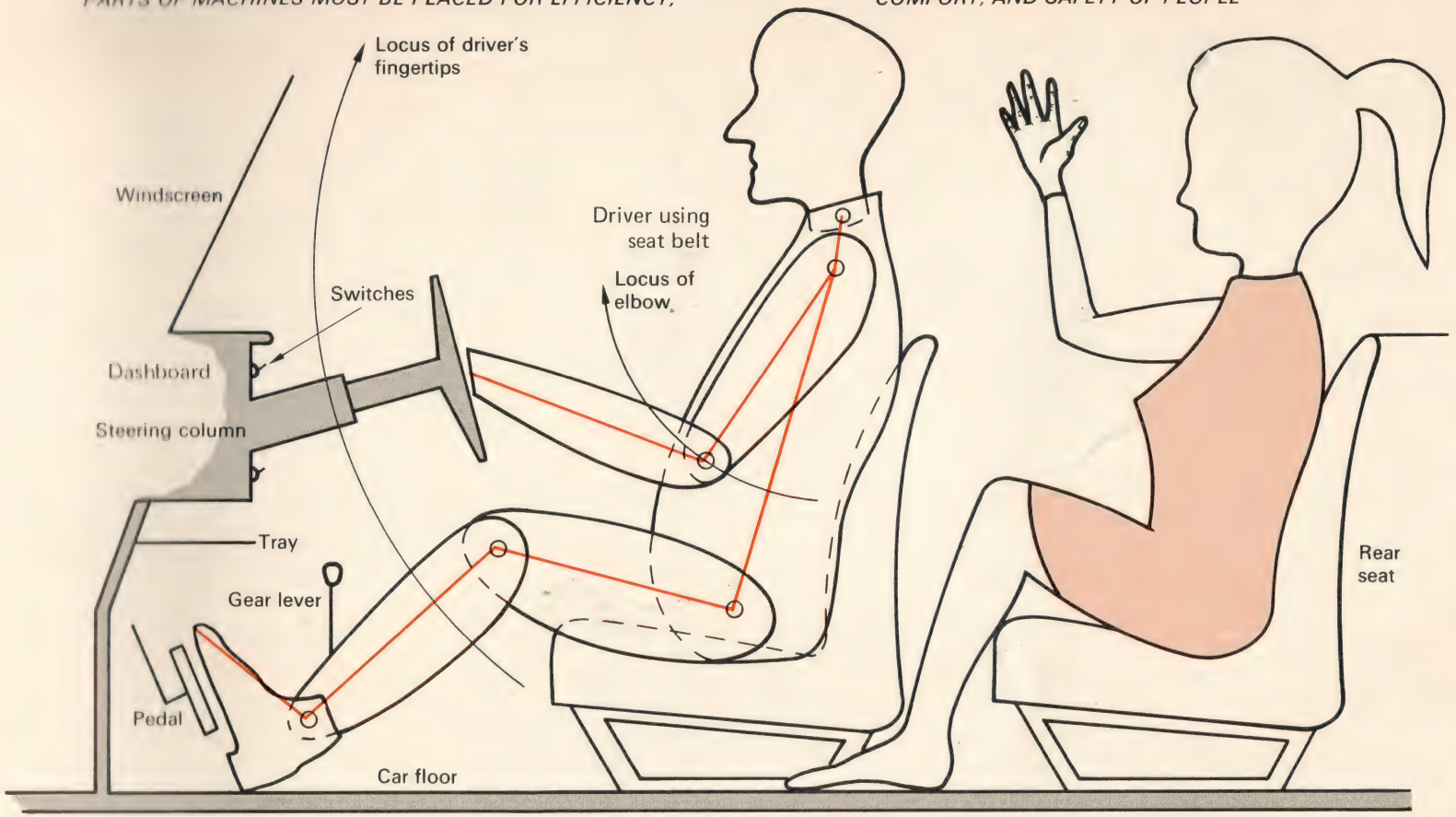
ERGONOMICS (2) SHEET 95

Articles which require a consideration, in their design, of the simple ergonomics of the hand, feet, arms, and fingers are shown in the figures.

Exercises

1. Design for yourself a junior hacksaw handle, following the principles illustrated. Include an end elevation, removed sections, and details of frame and adjusting devices.
2. Sketch the examples in Fig. 3 and dimension or list their important ergonomic features. Include references to human strength.
3. Sketch and list the ergonomic features of some of the following:
baby's bath on stand; ironing board; wheelbarrow handles; child's tricycle; deckchair; garden spade.
4. Discuss the ways in which design is affected by light, heat, sound, touch, smell, taste, strength, endurance, humidity, monotony, fashion, and prejudice.

PARTS OF MACHINES MUST BE PLACED FOR EFFICIENCY, COMFORT, AND SAFETY OF PEOPLE



CAN THE DRIVER OPERATE THE CONTROLS? *IS THE LADY SITTING COMFORTABLY?*

RECOMMENDED SCALE FOR ERGONOMIC MAN 1:5

ERGONOMICS (3)

SHEET 96

If a machine is to be used by people efficiently, in safety, and without fatigue, it must be planned with their size, shape, and senses in mind.

The ergonomic man in the driver's seat in the drawing would find it impossible to drive the car with the controls and himself in the positions indicated. His wife in the rear seat is in danger of breaking her ankle.

The first thing to do in a study of this kind is to obtain your ergonomic man. A good way to start is to measure one of the tall boys in the class. Alternatively, measure the skeleton in the biology lab. Divide the sizes by five when working to a scale of 1:5 for a large model. To this scale draw, firstly, a matchstick man, and then give him a simple human shape. Secondly, draw the parts separately on card, making allowance for joint overlap. Cut out the parts, and split-pin them together at the joint hinge points.

Exercises

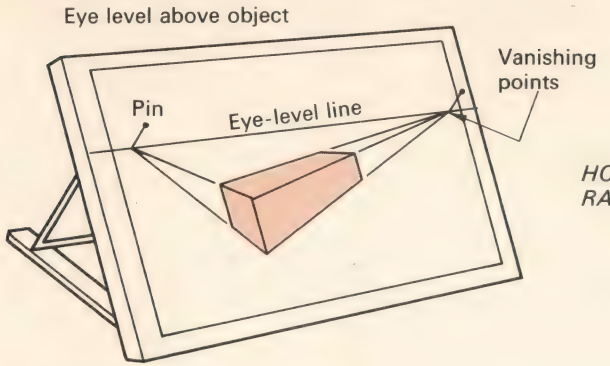
1. Study the drawing on a class–teacher basis, and identify the deliberate errors.
2. Make a template of a car seat to suit the man, and other templates of the controls. You should then be able to position these parts and the man on the drawing paper to the best possible advantage. You may realize that some parts may have to be redesigned.

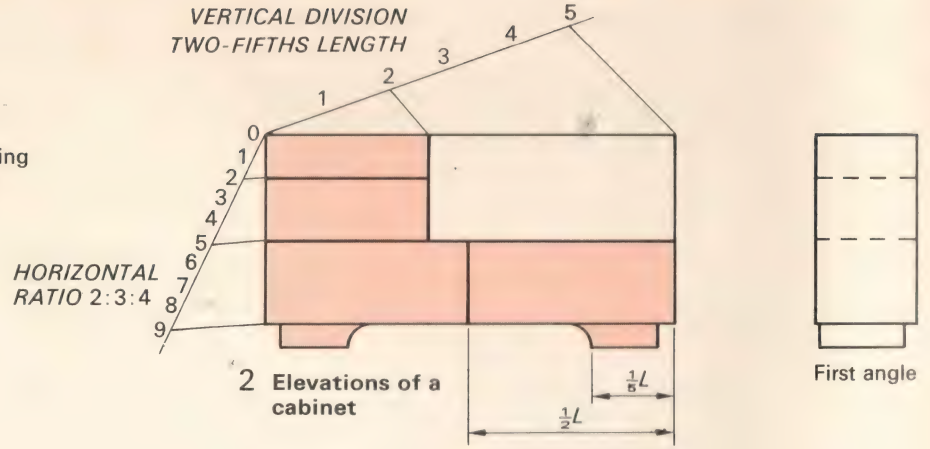
Take particular note of how far the man can reach when strapped into his seat. This has been indicated on the drawing by a compass arc—the *locus* or path of his fingertips.

These simple diagrammatic ergonomics will not tell you whether or not a man is feeling comfortable. To solve this question, it might be necessary to use real people in real or mock-up situations.

3. Using your model man, design around him *one* of the following: space venicle; go-kart; fighter-pilot's cockpit; sledge; land yacht; snow scooter; underwater scooter.

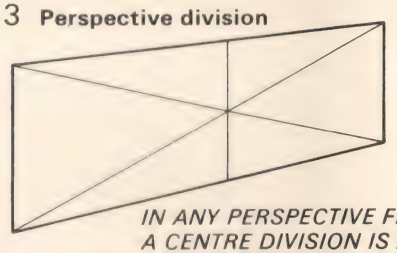
1 Pictorial view of drawing board with simplified perspective drawing



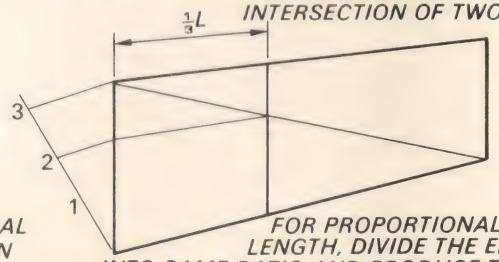


2 Elevations of a cabinet

3 Perspective division

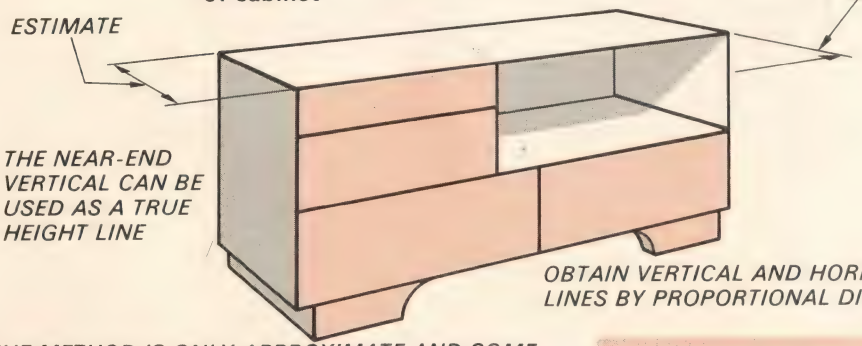


IN ANY PERSPECTIVE FRAME A CENTRE DIVISION IS AT THE INTERSECTION OF TWO DIAGONALS



FOR PROPORTIONAL DIVISION OF LENGTH, DIVIDE THE END VERTICAL INTO SAME RATIO AND PRODUCE TO DIAGONAL

4 Simplified perspective view of cabinet



THE METHOD IS ONLY APPROXIMATE AND SOME ESTIMATIONS HAVE TO BE MADE WHERE DIVISIONS ARE NOT IN A CONVENIENT RATIO

SIMPLIFIED PERSPECTIVE (1) — SHEET 97

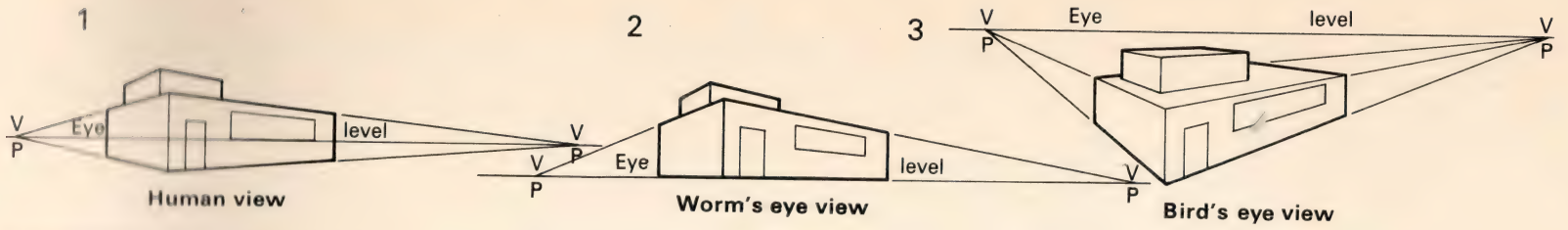
This system of simplified perspective enables us to obtain an approximate perspective view of an object without becoming involved in the more advanced projections of angular perspective. Used with care and good judgement, it provides a good illustration.

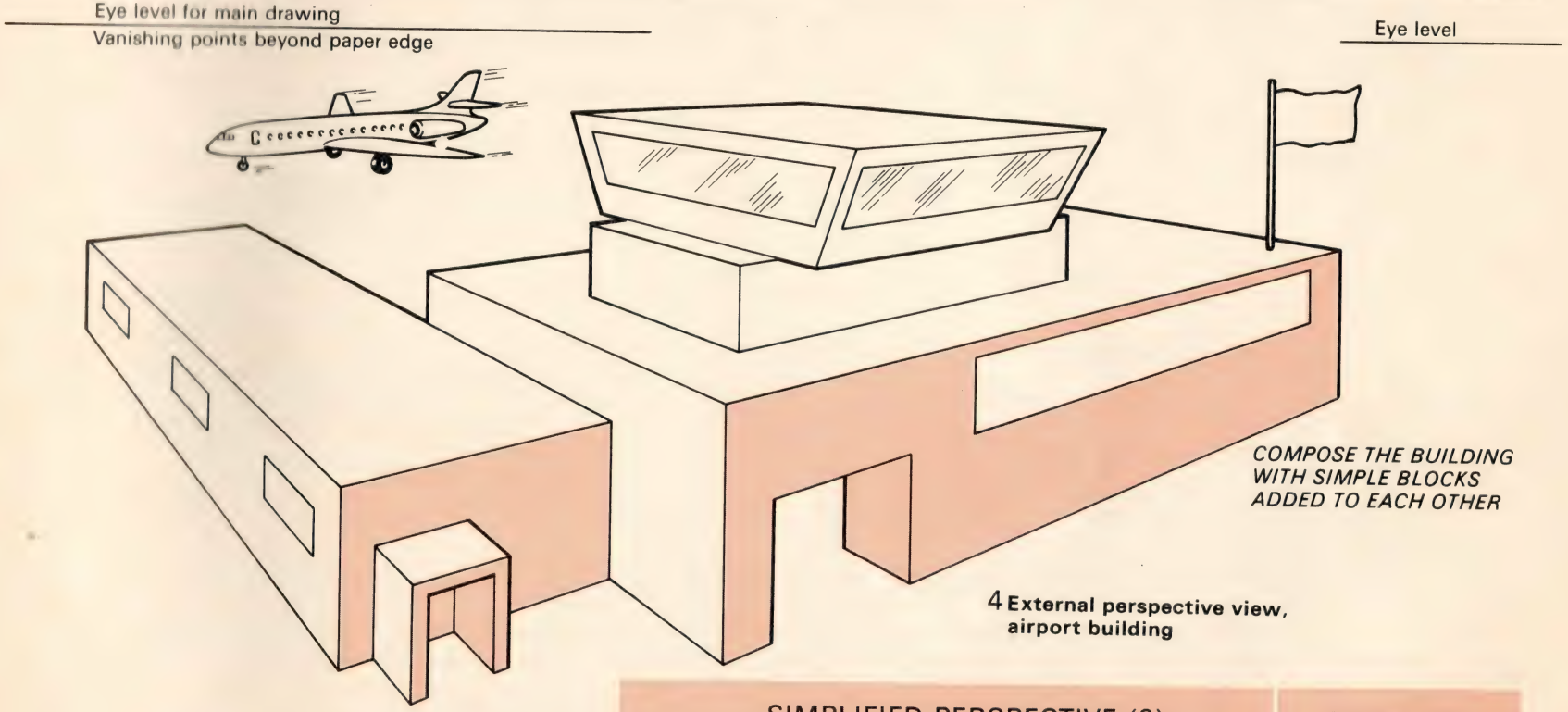
Exercises

1. Draw the elevations of the cabinet in Fig. 2.
2. Use the division methods in Fig. 3 to help you to project the perspective drawing in Fig. 4. Start with the nearest vertical, placing the eye level a short distance above it in the same proportion as it would be in a room situation.

Select the vanishing points to give a steeper end view and a longer front view, following the proportions shown in Fig. 1. The left-hand vanishing point (VP) is nearest to the corner, while the right-hand one is a much greater distance away to prevent severe distortion.

Pins are fixed at the VPs for easy location of the straight edge.





4 **External perspective view, airport building**

SIMPLIFIED PERSPECTIVE (2) — SHEET 98

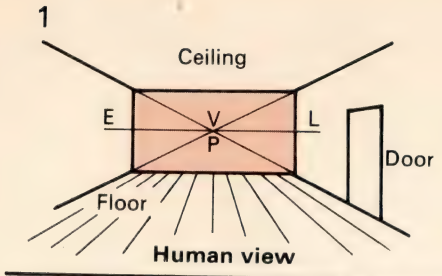
Figures 1 to 3 show the same building as seen from different eye levels, according to the position of the viewer. The sides of the building converge to the horizontal eye levels and meet at the vanishing points, VP.

In each case, the front corner of the building is a vertical line of the same height. It is also at the same level on the page, so that you may compare the figures and the effect of moving the eye level. Vanishing points should be chosen at good distances from the subject to prevent severe perspective distortion.

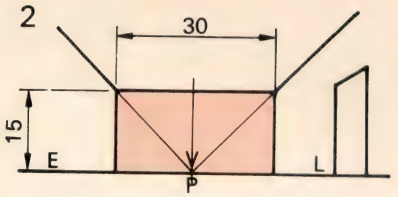
An airport building is shown in Fig. 4. Though the vanishing points are *off* the paper, all the lines can be seen to be in an approximate perspective with the exception of the control-tower corners.

Exercises

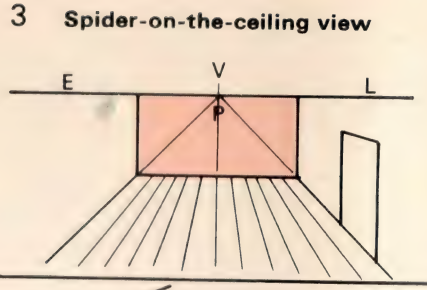
1. Keeping the eye levels as given, draw similar views to Figs. 1 to 3.
2. Make a closely similar drawing to Fig. 4, or invent your own.
3. From magazines and newspapers collect perspective views of building exteriors and interiors, and use one of these as the basis of another drawing.
4. Select one or two of your best illustrations (Exercise 3), and paste them on to card or thick A2 paper. Make sure that vertical corners of buildings are also vertical on the paper. Allowing for any photographic distortion, trace the main lines of the buildings or rooms to their vanishing points.
5. Obtain an illustration of a skyscraper building as seen looking down from the top of an adjacent building, or an aircraft. Trace the perspective lines to their vanishing points. You should find two points on the horizon eye level and a third below ground level.

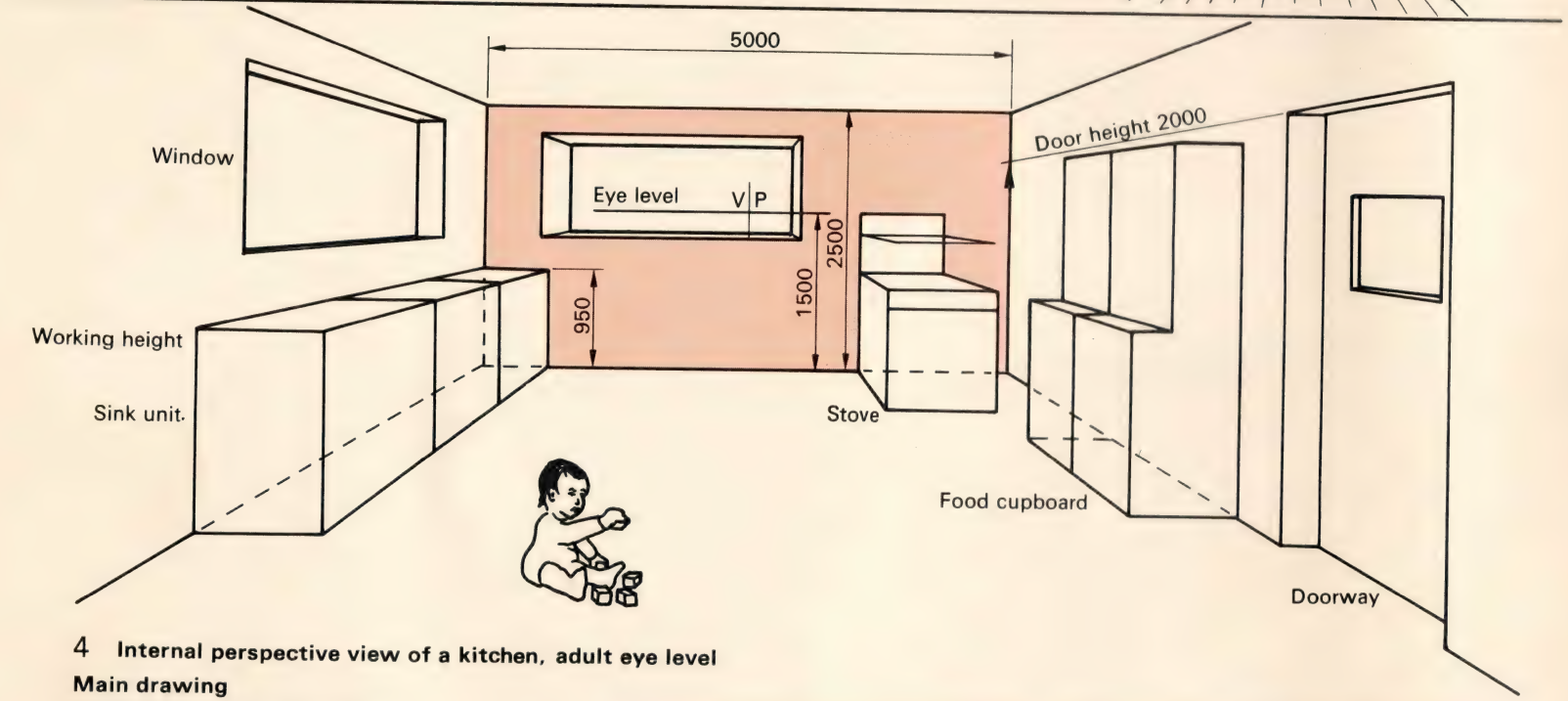


Human view



Mouse-on-the-floor view





4 Internal perspective view of a kitchen, adult eye level

Main drawing

DIMENSIONS IN MILLIMETRES

SINGLE-POINT PERSPECTIVE — SHEET 99

In some cases, enclosed or internal views may have one vanishing point at eye level in the centre of vision—i.e., opposite your nose. The internal view shown in Fig. 4 is one looking upon the end wall of a kitchen.

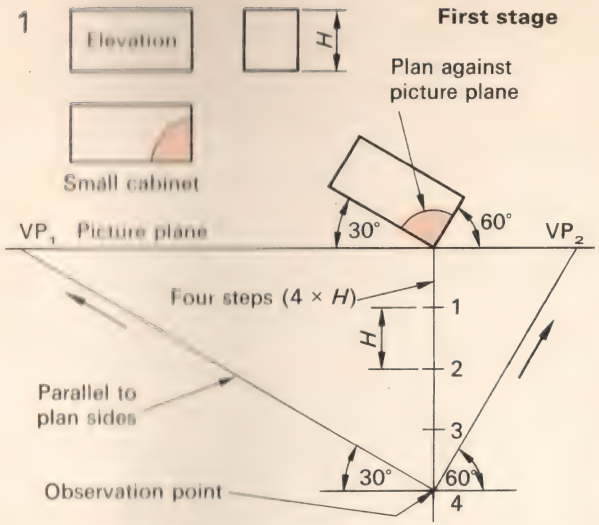
A view down the length of straight railway lines enclosed by hedges, banks, or fencing would also be an internal view with one vanishing point.

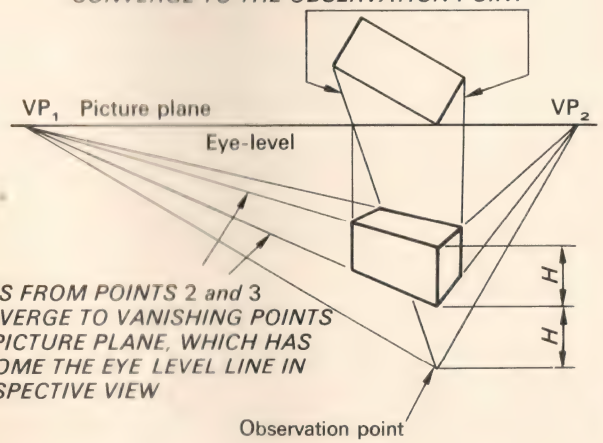
Figures 1, 2, and 3 show the same wall, but with eye levels in normal and extreme positions. The dimensions on Fig. 2 are in millimetres, for convenience.

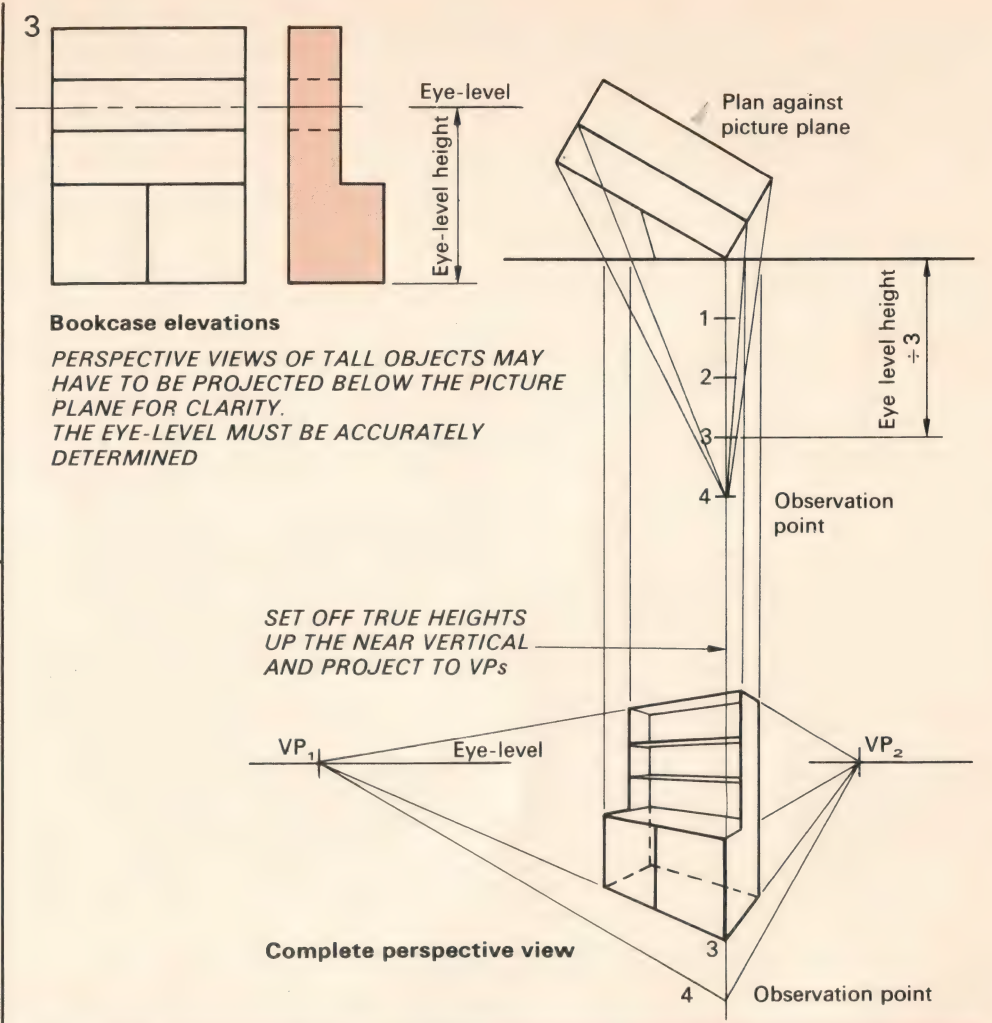
In the main drawing (Fig. 4), the single vanishing point is at the intersection of the horizontal eye level with the vertical centre line of the wall (as in Fig. 1). True sizes have been given, but these will obviously vary from kitchen to kitchen, and the eye level from person to person. The end wall, being square on to the viewer, may be used to scale off heights and widths of furniture before they are projected forward. This is clearly shown for the sink unit and the door height.

Exercises

1. Draw closely similar views to Figs. 1, 2, and 3.
2. Draw the view of the kitchen in Fig. 4. Supply those sizes and details which are not given.
3. Draw the same kitchen again, but in this drawing take the eye level to be that of the young child playing on the floor. Assume this height to be 400 mm.
4. Write a few short sentences to explain how the child's view differs from the adult's. What significance has this for accidents in the home.
5. Make a single-point perspective drawing similar to the one of the campus on Sheet 88.







ANGULAR PERSPECTIVE SHEET 100

The angular-perspective method provides a reasonably true perspective view of an object. Figures 1 and 2 show how it entails setting the plan view of an object at a reasonable viewing angle behind a vertical picture plane and projecting to an observation point in front of the plane.

This produces, on the picture plane, a true diminishment of length. This is then projected at right-angles to meet the lines converging to the vanishing points.

Exercises

1. Study Figs. 1 and 2 carefully, and redraw both of the stages to similar sizes.
2. Figure 3 shows the relationship between a tall object and the eye level. The perspective view has to be projected to a position below, to clear the plan and picture plane, so that these are not overdrawn or overlapped.

Draw your own elevations of a bookcase, and then produce an angular perspective drawing of it, following the example which has been given.